CHEMISTRY

50¢

Interchangeable Resources

COAL used to be a rock-like fuel noted for its blackness. You shovelled it into your furnace and opened the drafts wide so the gases it gave off would burn and not asphyxiate you. Then you shovelled the ashes and clinkers out and threw them away. You used the heat from the chemical reactions that went on in your furnace, but all the products went to waste.

Gradually chemical know-how modified the use of coal. Oils, gases and tars were recovered for their value as materials, leaving the carbon as coke in even more efficient form for burning. A rainbow of coal-tar dyes made from these by-products dramatized the contrast between the old way and the new.

Only recently has the corresponding change in the utilization of petroleum chemicals taken place. Individual hydrocarbons have been ticketed as to their usefulness for particular purposes. Gasolines and fuel oils have been defined with more specific properties. Separated compounds have become the starting point for the manufacture of many new materials.

At the same time, some of the hydrocarbons derived from coal have come onto the market as substitutes for gasoline. This is all in accordance with excellent chemical practice. As chemical usefulness is kept in view, new economies are sighted. Sulfur can be recovered from undesirable oils, supplementing our stock of a resource which is becoming scarce. How to adopt our resources for better fulfillment of our needs is a continual challenge to the chemist.

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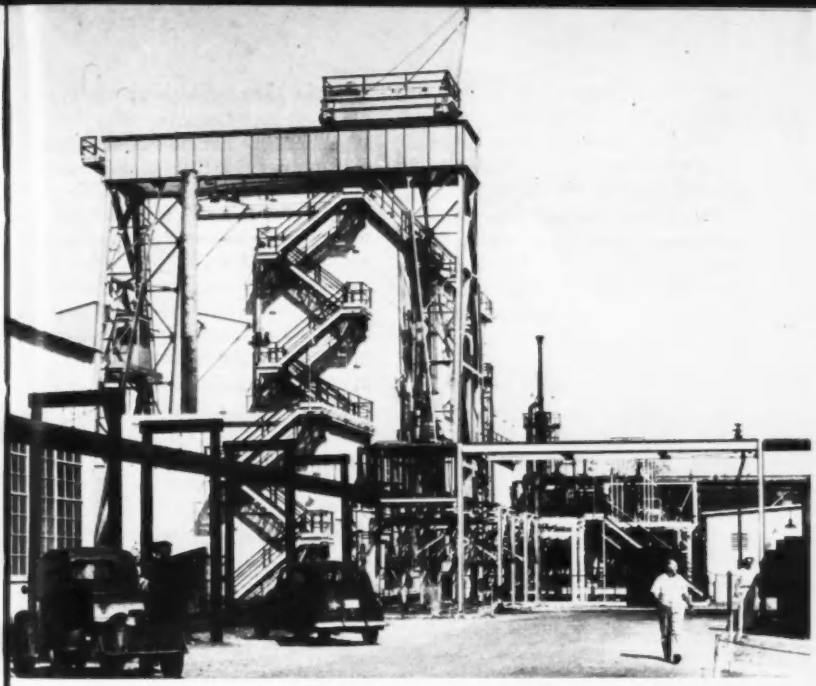

➤ SAFETY CONSTRUCTION *is necessary in converting coal to gasoline as shown at the synthetic liquid fuels demonstration plant of the U. S. Bureau of Mines, Louisiana, Mo. Shown are heavy concrete structures enclosing high-pressure coal-hydrogenation furnaces.*

Gasoline From Coal

by A. C. MONAHAN

➤ SYNTHETIC GASOLINE can be made from coal to sell profitably at 11 cents a gallon at the refinery, a recent report to the U. S. Department of the Interior by a New York engineering firm states. However, it would have to sell at about 16 cents a gallon to attract enough private capital to construct and operate the plant, and all important chemical by-products would have to be recovered and sold. Production of gasoline from petroleum, the report states, costs from 12 to 13 cents a gallon.

The engineering firm, Ebasco Services, Inc., was engaged by the U. S. Bureau of Mines to study detailed plans made by the Bureau for two hypothetical commercial coal-hydrogenation plants, one in Kentucky and one in Wyoming. Each would pro-

duce 30,000 barrels of liquid fuel products per calendar day. Their activities would extend from coal mining to the recovery of the fuels and also the recovery of by-products.

The Bureau's claim was that such plants could produce motor fuel at a cost of a little less than 11 cents a gallon. With this the National Petroleum Council disagrees, estimating that the cost would be nearer 41 cents a gallon. The New York independent engineering firm was engaged to study the entire proposal and to give an unbiased opinion.

The Ebasco report seems to substantiate the estimates made by the government experts but it emphasizes that the production of motor fuels to sell at 11 cents a gallon requires the recovery, purification and sales of by-product chemicals to make this price possible. These chemicals, for which there is a growing market, include benzene, phenol, toluene, xylene, cresols, ammonia, sulfur and liquid petroleum gas. Production of some of these would be in direct competition with products now obtained from petroleum.

The plants proposed by the Bureau of Mines to produce over 10,000,000 barrels of liquid fuels a year would cost a lot of money. Some $400,000,000 of capital investment would be needed to construct and equip the plant, purchase machinery for mining the necessary coal and for operation until sales brought in sufficient income to operate on its own revenues. Heavy items of construction include over $50,000,000 for a power plant and even a larger amount for a hydrogen plant to produce the large amount of hydrogen used in the coal-hydrogenation process.

Behind the question of the cost of making gasoline from coal is a difference of opinion on the part of the Bureau of Mines and the petroleum industry as to the need of commercial production of liquid fuels from coal at the present time. The industry seems to feel that there is plenty of natural crude oil to supply all needs for several generations to come.

Natural Oil Conserved

On the other hand, the Bureau appears to believe that the supply of natural oil should be conserved and that part of the daily need should be met by synthetic products from coal and oil shale. Its pilot plant at Louisiana, Mo., has proved, it claims, that liquid fuels can be made from coal at a reasonable price and its pilot plant at Rifle, Colo., has proved that great quantities of fuel oils can be obtained, also at a reasonable cost, from America's plentiful supply of oil shales.

National security is another thought in the minds of government oil experts. In case of an emergency, such as another world war, a domestic supply of liquid fuels to meet every situation is essential. Imports of petroleum from Venezuela and the Near East might be cut off. Coal and oil shale can supply America's needs, supplementing natural crude oil mining, provided commercial plants are in operation. If commercial plants are constructed in the next few years, the plants would be ready, invaluable experience would be gained by American industry, and more economical methods of production undoubtedly would be developed.

Also it is known that American de-

mand for liquid fuels will greatly increase in the years to come. Many additional motor vehicles will be added to the over 40,000,000 now using American highways. Air transportation is certain to increase by leaps and bounds. Far greater quantities of all types of aviation fuels than now used will be required.

American railroads are rapidly switching to diesel locomotives. Millions of homes are heated with fuel oils. Tractors are replacing horses and mules on American farms. These are just a few of the examples that might be cited to show that greatly increased quantities of liquid fuels will be needed in the future.

Just how long petroleum reserves will be able to meet the present and increasing needs is anybody's guess. Present proved reserves will probably be able to do so for several generations. Alarmists have been predicting for over 50 years that petroleum reserves are facing exhaustion. However, new oil fields are being discovered and proven reserves today are greater than ever before.

Many of these new fields are not within the continental United States and would probably be of little help in supplying domestic needs in time of a great emergency. An exception to this is the important field opened two years ago near Edmonton, Alberta, Canada. Newly discovered fields in Mexico might also help in a crisis.

Undoubtedly there is much underground oil within the continental United States not yet discovered. There are vast areas, particularly in the central states and the eastern slopes of the Rockies, that are regarded by petroleum geologists as possible oil territory. Another source of American oil is continental shelves under the water off the coasts of Louisiana and Texas and possibly off the Atlantic coast of Florida. A number of wells have been drilled out in the Gulf of Mexico, and oil is being produced from some of them. One is 30 miles off the Louisiana coast.

Under-Ocean Wells

These under-the-ocean wells are expensive to drill and to operate. Also they are exposed to enemy submarines in case of war. Undoubtedly in time the continental shelves will become a very important source of petroleum, but before they are developed in large numbers inland sources will be more nearly exhausted. Thousands of wildcat wells are being drilled each year in the search for new oil fields. Geologists can locate probable oil areas but whether or not they contain petroleum in pay quantities can be determined only by drilling. This is a costly process.

In the search for oil, the petroleum industry is going deeper and deeper into the earth. In the earliest days of oil production a 100 foot well was considered deep. Later, when petroleum products came into real demand, 1000- to 2000-foot wells became common. These were followed by wells a mile deep. Now there are a few wells that extend some 20,000 feet under the surface of the earth.

This deep drilling is of course expensive, and the cost must be borne finally by the users of the products. But as costs for petroleum products increase because of higher costs of production, synthetic liquid fuels from coal and shale can become more competitive.

Another step being taken by the oil industry is the more complete recovery of the petroleum deep under ground in fields that have been in production for years. Experts estimate that only about one-third the crude oil in the oil-bearing strata within the earth is removed by ordinary pumping. In quite general use now is the recovery of another third or so by means of pressure. Water, gas or air is forced down a central well to the oil-bearing strata to force oil in the earth to the wells under pumps for recovery. Chemical treatment of the oil-bearing earth is also helping greater recovery.

Petroleum From Alaska

Alaska as a source of petroleum is one of the bright spots in the American liquid fuels outlook. Post-war drilling in northern Alaska leads geologists to believe that hundreds of millions of barrels of oil and large amounts of natural gas are deep in the earth below. The possible area is held in a naval reserve, and the test drilling is being conducted by the U. S. Navy and the U.S. Geological Survey.

Unusually difficult conditions surround the production of oil in this Alaskan area, but they are not insurmountable. It is north of the Arctic Circle where many difficulties are encountered not found in most oil fields. However, experts claim that the products after mining can be carried by pipelines south to Fairbanks and Anchorage for refining and use, and for shipment by tankers from the latter center.

Behind the attitude of the National Petroleum Council which seems to be against the production of liquid fuels from coal in the immediate future, are findings of the American Petroleum Institute given in a recent report concerning known and proved reserves of liquid hydrocarbons in the United States at the close of 1950.

Proved reserves refer only to those whose locations and extent have been proved and measured. They do not include possible oils which may underlie vast untested American areas which appear favorable to the accumulation of oil. The institute's estimate of liquid hydrocarbons in proved reserves at the close of 1950 was 29.5 billion barrels.

Total new supplies of crude oil and natural gas liquids developed in 1950 amount to an estimated 3.3 billion barrels, according to the report. Total production of liquid hydrocarbons for 1950 was close to 2.2 billion barrels, or about two-thirds as much as the new reserves discovered.

In spite of the reassuring figures which indicate that America has enough natural crude oil to meet all power and heating needs for years to come, it is generally conceded that a time will come when the reserves will be exhausted. America has enough coal to last several thousand years at the present rate of consumption. It would seem that a day will come when this coal, together with oil shale, will have to be the source of America's liquid fuels. It is in order to be fully prepared to meet this day that government officials have developed methods of obtaining liquid fuels from coal and shale, and they believe that commercial production from these sources should begin soon.

Gypsum promises to become an important source of sulfur.

Oil-forming Deposits Discovered in Ocean

Radiocarbon Dating Finds Recent Oil

➤ Our vast oil-using civilization is powered by the remains of marine life which form the crude petroleum of our oil wells of today.

This is the logical extension of the discovery of the formation of hydrocarbons with oil-like characteristics in the recent sediments of oceanic tidelands. Paul V. Smith, Jr., of Standard Oil Development Co. gave the details of contemporaneous origin of petroleum to the journal, *Science*, a discovery that had been reported earlier to the American Chemical Society.

As recently as 1934 competent geologists were unable to find evidence that liquid hydrocarbons are forming in marine sediments as they are deposited. But Mr. Smith dug into the problem anew and, in sediment samples from off the Gulf of Mexico coast of Louisiana and Texas, found organic matter ranging from 30 to 450 parts per 100,000 and free hydrocarbons from 2 to 19 parts per 100,000. The organic matter was shown to have a composition of paraffin-naphthene, aromatic and asphaltic components similar to crude oil.

While the percentages present are small, Mr. Smith estimates that a cubic mile of marine sediments he sampled down to 106 feet contains 4,500,000 barrels of an oil-like mixture. This is 7,000 barrels per acre for a column one mile deep and the figure is labeled conservative.

Radiocarbon dating tests done at Columbia University's Lamont Geological Observatory show that the sediments are recent in origin as shown by the radioactivity of their carbon 14, and that the hydrocarbons are deposited with or generated in the sediments themselves.

The petroleum-like mixture discovered in formation at the present time is a composite of the hydrocarbon remains of many forms of marine life, Mr. Smith suggests. Crude oils of varying composition from past ages might result, in his opinion, from changes in the relative contributions of different forms of marine life. In various laboratories suitable hydrocarbons have been detected in oysters, bluefish, marine bacteria, and even barnacles.

Williston Basin Promising

➤ The Williston Basin of the Dakotas and Montana gives a promise of being one of the major oil fields of America, the American Petroleum Institute was told by S. F. Bowlby, Shell Oil Company, Los Angeles. The prediction is made on a basis of its geological structure and the success of wells already drilled.

The Williston Basin is a large area in the western part of the Dakotas and eastern Montana in the United States, and southern Manitoba and Saskatchewan in Canada. Drilling is now largely in North Dabota. The first major oil discovery in the basin

was made early in 1951. Since then some 75 new field wildcat wells have been drilled in the American area and have resulted in 13 discoveries of one sort or another. This is pronounced by Mr. Bowlby as a high success ratio, considerably higher than that for the entire United States during the past ten years.

At present, in the American area of the basin there are 80 drilling rigs, and 120 seismic crews studying geological structures with the underground sound wave method long used. Some 80% of the potential oil area is now under lease to oil companies. According to Mr. Bowlby, the activities show that in the judgment of the oil industry as a whole, the Williston Basin constitutes a major oil province.

The Williston Basin, he said, is the largest basin of sedimentary deposition favorable to the accumulation of oil on the North American continent. Its sedimentary section reaches a thickness of 12,000 feet in its deepest part. This centers along the Montana-North Dakota border. The total basin is not yet clearly defined because there is no real geological barrier between it and the great Alberta Basin, which includes the prolific fields of Alberta and extends northward into the Fort Norman area where oil has already been found.

Crude Oil For Many Years

➤ THERE IS plenty of petroleum within the United States to meet all requirements for many years to come. This prediction was made to the American Petroleum Institute, in the light of present proved reserves, probable reserves, and the rapidly growing demand for liquid fuels.

"It is my firm conviction that the domestic oil industry can supply sufficient oil to meet all of our needs for the foreseeable future," it was declared by John E. Swearingen, manager of production of the Indiana Standard Oil Company. He presented an analysis of the probable availability of crude oil and natural-gas liquids during the next 15 years. The probable demands for the same period were presented by John W. Boatwright, manager of distribution economics of the same company.

In considering these predictions, Mr. Swearingen stated, it should be kept in mind that geologists in the United States and Canada have been very successful in finding new oil fields during the past two or three years. This is responsible for their confidence in their continued ability to find oil.

Pointed out among relatively recent discoveries were the oil fields of west Texas, the Gulf Coast, Alberta, Canada, and in Nebraska, Colorado and Utah. Perhaps most important of all, he said, is a major new oil province in the Williston Basin, North Dakota. The outlook today is brighter than it was five years ago, he indicated, "We feel that domestic production of crude oil will continue to increase over the period we have considered. We shall be finding oil faster than we shall be using it."

American oil industry by 1967 will be producing about 8,000,000 barrels per day of crude oil and 1,100,000 barrels per day of natural-gas liquids. This is an increase of about 33% over today's production. There are still areas in the United States believed by petroleum geologists to contain oil

but which as yet have not been explored by drilling. It is only by drilling that the presence of oil deep in the earth can be proved.

Current Should Free Oil

➤ BY CAUSING electric currents to surge through existing oil wells, engineers hope to raise the rate of oil flow.

Prof. C. Malcolm Davis, Pennsylvania State College petroleum expert, told a conference on petroleum production that electric power might crack the underground rock formations, allowing the oil to drain more easily from the rock. It also might generate so much heat that oil flow would be raised.

Prof. Davis said his research indicates that electrodes might be buried at the oil-deposit depth and about 100 feet apart. In some cases, they might be put in existing wells.

New Refinery Devices

➤ A NEW TYPE of distillation tray to use in the giant towers of petroleum refineries to increase their capacities, and improvements in the catalytic cracking of crude oil will enable the oil industry to meet better the growing demands for liquid fuels and other products and make fuller use of the nation's oil reserves.

These trays used in the refineries towers are unknown to the general public but they play an important part in the separation process. The new tray is much simpler than those now in use. It will cost less, lengthen the useful life of refinery fractionating towers and increase the capacity of the industry.

In these towers the crude oil is separated into gasoline, naphtha, diesel oil, heating oil and other products by heat and distillation. The lighter parts, such as gasoline and naphtha, vaporize first and rise to the top. Heavier products of distillation are withdrawn from the tower at lower points. Spaced at various levels in the tower to separate the oil components are a series of partitions or trays.

The most common tray in use today is the bubble-cap type, which is a complicated structure of mushroom-shaped bubble caps on a flat plate. The new tray, developed by the Shell Development Company, New York, consists of little more than a sheet of metal stamped with parallel slots of proper width and spacing.

New fluidized-solids technique is permitting more use of the country's petroleum resources, the American Institute of Chemical Engineers was told at a recent meeting in Chicago by Dr. R. C. Gunness of the Standard Oil Company of Indiana. It involves the use of finely divided particles of a solid as a catalyst in the tower to obtain the particular products desired by the catalytic cracking process.

The principle of fluidization, he said, is that of taking a finely divided solid and blowing a gas through it to make the bed of solids assume liquid properties. World War II needs for more aviation gasoline and synthetic rubber spurred on the development of catalytic cracking but in the years since the war there has been further development.

Petroleum For Chemicals

➤ THE GROWING importance of petroleum as a raw material for the production of chemicals was emphasized to the American Petroleum Institute

by T. S. Petersen, president of Standard Oil Company of California.

The petroleum industry today produces about one-quarter of the nation's organic and inorganic chemicals, he said. In ten years that figure will likely rise to 50%. In spite of the rapid growth of the so-called petrochemical industry, it consumes less than one percent of the total petroleum production.

One of the more spectacular evidences of the value of research is the birth of the petrochemical industry, Mr. Petersen stated. The swift perfection and adoption of chemical synthetics quickly ran away from the coal-tar and agricultural industries. They could not supply sufficient raw materials. So the oil industry stepped into the breach.

Among chemical supplies provided by the oil industry Mr. Petersen cited the tremendous production of nitrogen fertilizers now making land more productive. Also the industrial alcohols now made from petroleum. Grain and sugar long used for making alcohol are now available for food. Petroleum detergents are threatening to take over the packaged-soap market, freeing fats and vegetable oils for other uses.

The growing use of petroleum and its products for traditional uses, as well as in the petrochemical field, is promoting a search for more oil deposits. In our unending search for additional oil and natural gas, he stated, we are turning more and more to science. We are turning to geology, geophysics, engineering, paleontology, geochemistry, micropaleobotany and a host of other specialties.

Fat Made Outside Body

➤ FOR THE FIRST time, scientists have succeeded in extracting from living tissue a water-soluble substance which can make fat.

What may be the first step toward production of fat from sugar outside the living body was announced by Dr. Samuel Gurin of the University of Pennsylvania School of Medicine at the symposium on nutrition sponsored by the Harvard School of Public Health and the New England Postgraduate Assembly in Boston recently.

The achievement will, it is hoped, give scientists new information about the intermediate steps in the complicated synthesis of fat in living tissues.

Normally the liver makes fat out of sugar and starches. Livers of diabetic animals, however, cannot do this. Fasting, or even a drastic change in dietary such as a high protein diet, will have a similar effect in lowering the liver's ability to make fat.

Insulin stimulates this process in normal livers but has no effect in liver slices living outside the body when they are taken from rats or cats with diabetes.

The growth hormone of the pituitary gland in the head and that other famous pituitary hormone, ACTH, also have been implicated as substances which can in some way stop the synthesis of fat by living tissue.

Blood Globulin Halves Chance of Polio Paralysis

Paralytic Polio Preventive

► GAMMA GLOBULIN from human blood can more than cut in half the likelihood of children getting paralytic polio. The protection it gives lasts at least five weeks and is effective against all three known polio viruses.

These results from trials involving 55,000 children were announced by Dr. William McD. Hammon of the University of Pittsburgh at the recent meeting of the American Public Health Association.

The trials were made in Harris County, Texas, and Woodbury County, Iowa-Dakota County, Nebraska, this past summer and in Provo, Utah, in the summer of 1951.

Of all the children given injections, 90 developed paralytic polio. Of these, 26 were children who got gamma globulin and 64 were children who got a harmless, inactive gelatin injection. This gelatin was given to half the children in the trials, but no one knew until results were tabulated which child got gelatin and which gamma globulin.

The difference between the two groups is "statistically significant" in showing the effectiveness of gamma globulin for protecting against paralytic polio, Dr. Hammon said.

In the first week following the injection, almost as many cases occurred in the gamma globulin group as in the gelatin, or control, group. But the cases in the gamma globulin group were mild and within 30 days half the children had recovered completely. None in the control group had recovered within 30 days.

During the second week the difference was marked. Only three children in the gamma globulin group got paralytic polio compared to 23 in the control group. From the second through the fifth week only six cases occurred in the gamma globulin group, but 38 in the control group.

The gamma globulin was furnished by the American Red Cross. It was prepared from blood collected during World War II from tens of thousands of blood donors all over the country. It is the first material that has been scientifically proved to be effective in preventing human paralytic polio.

The present supply of this material for polio prevention is extremely limited and completely inadequate to meet the expected needs, Dr. Hammon said.

Enough for "reasonable use" will be available, Dr. Hammon believes, if public cooperation in giving blood comes up to the cooperation he found in making the field trials of the material for polio prevention.

These field trials, largest in medical history, were made possible by a grant of $1,000,000 in March of Dimes funds from the National Foundation for Infantile Paralysis.

Questions still to be answered about gamma globulin as a polio preventive are: Is protection good for only five

weeks? Can this period be extended by increasing the dose or by a second injection? And, most important of all, does gamma globulin let the child get a harmless, unapparent polio infection that will give him permanent immunity to the disease?

Associated with Dr. Hammon in the trials and report of them were Drs. Lewis F. Coriell of the Camden, N. J., Municipal Hospital, Paul F. Wehrle of the U. S. Public Health Service, Christian R. Klimt, Rockefeller Foundation fellow, and Joseph Stokes, Jr., of the Children's Hospital and University of Pennsylvania, Philadelphia. Local doctors and nurses in the test areas assisted Dr. Hammon's test teams in the trials.

Transparent Bandage For Burns

➤ A TRANSPARENT, flexible plastic dressing for burns and other wounds that can be sprayed on from an aerosol bomb was announced by Capt. Daniel S. J. Choy, USAF (MC), of the Aero Medical Laboratory, Wright-Patterson Air Force Base, Ohio, at the meeting of the Association of Military Surgeons of the United States.

Only disadvantage given is the fact that the dressing is flammable. It keeps out germs, lets the surgeon see how the wound is healing, is more comfortable than pressure dressings, and peels off easily. It is a polyvinyl plastic in an ethyl acetate solution.

Blood Traced by Serum Identification

➤ IF YOU want to know whether the blood in a blood stain came from a dog, deer, man or beefsteak, the Wisconsin Alumni Research Foundation, Madison, Wis., can supply the specific immune serum for identification. The Foundation laboratories are also making identification tests employing the serum.

Material is now available for tests for horse, beef, human, sheep, pork, dog, cat and deer serum and the stock will be expanded as others are prepared on request.

The material is now shipped with dry ice but it is hoped that eventually it can be freeze-dried and sent throughout the world.

Peppery Taste Made Chemically

A peppery bite taste more pleasant that that of the natural black pepper taste substance has been achieved in chemical manipulations by Drs. Torsten Hasselstrom, Harold W. Coles and Norene E. Kennedy at the U. S. Quartermaster Corps' Pioneering Research Laboratories in Philadelphia.

They did this by substituting chemicals called pipecolines and methyl pyrrolidones for piperidine which gives taste to pepper's piperine.

A taste-testing panel of eight members evaluated the new chemicals.

New Blood Improvements To Prolong Its Usefulness

Longer Useful Life For Blood

A round-up of the latest work on the problem of keeping a supply of usable blood always on hand to meet the increasing demand.

Blood Cells in Glycerine

➤ HUMAN red blood cells can be kept frozen in a 15% glycerine solution for periods of six months and still show the same ability as fresh cells to survive in the body after transfusion.

This has been reported in the British medical journal, *Lancet,* by an Anglo-American team of doctors working at the National Institute for Medical Research in London.

The doctors kept their red cells frozen at either five degrees above or 110 degrees below zero Fahrenheit for six months at a time, thawed them, removed the glycerine and then transfused them, together with fresh cells of a different blood group, into anemia patients whose own cells were of yet different blood groups to either of the transfused cells.

It was by this difference in the blood group types of the various cells that the doctors were able to identify them and count them at several time intervals after the transfusion. In this way the doctors were able to note what percentage of the frozen cells and of the fresh cells survived at each interval.

They found that the cells stored at both low temperatures were capable of normal survival in the body after transfusion equal to that of the fresh cells. However. the cells kept at the colder temperature survived the storage period two to three times better than those at the higher, so the colder was the more desirable method of storage.

The doctors point out that two obstacles must be overcome before storage of red cells in the frozen state can be of practical value in the field of blood transfusion. These are the present complexity of the method of removing the glycerine in which the cells are frozen and the high destruction rate of the cells during storage. There is already promise that both these obstacles are being overcome.

The doctors cooperating in this research are P. L. Mollison of England and H. A. Sloviter and H. Chaplin of the United States. Dr. Sloviter is an American Cancer Society fellow and Dr. Chaplin is a U. S. Public Health Service research fellow.

Albumin Safer Than Plasma

➤ ALBUMIN from human blood may be safer to give patients than transfusions of pooled blood plasma or serum or even single donations of blood or plasma.

The greater safety lies in the much smaller, almost nonexistent risk of the patient getting homologous serum jaundice from the albumin.

Studies showing this are reported by Drs. Richmond S. Paine and

Charles A. Janeway of Harvard Medical School and the Children's Medical Center, Boston, in the *Journal* of the American Medical Association.

Reason for the greater safety is apparently the heating for 10 hours at 140 degrees Fahrenheit that is normally carried out in preparing albumin. This seems to inactivate the virus that causes homologous serum jaundice and the underlying liver disease, serum hepatitis. The liver disease may occur without jaundice. This kind of jaundice and liver disease is not the same as the one doctors call infectious hepatitis. Infectious hepatitis usually comes in epidemics and is more like other so-called catching diseases.

The Boston doctors studied the records of 237 patients who were given human albumin by injection into the veins in four Boston hospitals during 1950 and the first half of 1951. Excluding those who died within five months after getting albumin, and might therefore have developed homologous serum jaundice if they had lived long enough, and those who had liver disease, there were 33 patients who got albumin only and 93 who got blood or plasma in addition to albumin.

No case of homologous serum jaundice occurred in the 33 who got only albumin. The probability of this disease failing to occur by chance alone is under one in 10 million.

In the group of 93, there were two probable cases of homologous serum jaundice. One of these also got human thrombin, from a lot later found to have caused the jaundice in 40% of patients getting it. The other had 28 blood transfusions which might have caused the jaundice.

Homologous serum jaundice is a serious disease which can be fatal. How the virus gets into the blood, except through the blood of another person, is not known. Medical and health authorities are concerned about it because plasma, pooled from many blood donations, is so likely to have the virus in it. While not every person getting plasma known to be infected gets the disease, as many as 100% of persons getting plasma later found to be infected have gotten jaundice. The average attack rate for known infected material is 40%.

Plasma Extenders Needed

➤ CHEMISTS were called upon to develop plasma extenders to save the lives of victims of a major catastrophe. Dr. I. S. Ravdin, professor of surgery of the University of Pennsylvania Hospital, declared at a recent meeting of the American Chemical Society that obtaining enough blood and plasma would be difficult as there is no absolutely safe method of sterilizing blood. Both blood and plasma can transmit the virus that causes acute inflammation of the liver, called homologous serum jaundice.

Because of the danger of a major disaster, such as atomic bombing, Dr. Ravdin told the chemists that there must be consideration of various plasma extenders, as the dextrans, PVP or polyvinyl pyrrolidone, and the gelatins which can be made in unlimited amounts and stored for unlimited time.

There is now a considerable likelihood that red blood cells can be stored for as long as nine months in the

frozen state and still live as long as freshly-shed blood when injected into the veins, Dr. Ravdin explained, although this is not possible for whole blood.

To Keep Blood Fresh

➤ A NEW CHEMICAL that promises to allow human whole blood to be preserved for longer periods than is now possible was reported by Dr. Otto Schales of Tulane University to the American Chemical Society. The new chemical, not yet clinically tested, is dimethylamino-isopropyl-phenothiazine.

It was developed on the theory that an enzyme action similar to digestion of food in the stomach works on the red blood cells and so weakens them that they can not withstand the stress of circulation in the body after 21 days storage. Cells treated with the phenothiazine compound were stored for seven weeks and were no more fragile than fresh red cells.

Prevents Blood Clot

➤ GOOD RESULTS with a new synthetic anti-blood clotting chemical are reported by Drs. Donald A. Scholz and Nelson W. Barker of the Mayo Clinic and Foundation, Rochester, Minn. The drug may prove useful in preventing blood clots in veins.

It is called Treburon. It is the sodium salt of sulfated polygalacturonic acid methyl ester methyl glycoside.

It has from one third to one fourth the power of heparin, naturally occurring body chemical which slows the rate of blood clotting.

Mild nausea and tingling of the fingers were the only signs of bad reactions to the drug and these appeared in only one of 12 patients and did not last long.

The study of Treburon at the Mayo Clinic followed reports from scientists of Hoffmann-La Roche, Inc., of its effects on rabbits, and of tests on patients by scientists at Marquette University School of Medicine, Milwaukee.

Anguish Cause is Chemical

➤ THE ANGUISH felt by some patients with intractable pain and by some mental patients is caused by a substance in the blood. This new view of the cause of such anguish has been developed by Dr. Carney Landis of the Psychiatric Institute, Columbia University.

The anguish substance or chemical in the blood is so far only hypothetical. It has not actually been detected. Dr. Landis therefore names it only after the first letter in the Greek alphabet, alpha.

The alpha substance, he believes, sensitizes some of the brain tissue, probably the frontal lobes, in susceptible persons. Not all persons are susceptible, just as some but not all persons are sensitized by ragweed pollen to develop hay fever.

Existence of this alpha chemical explains, Dr. Landis thinks, why some patients who have had their anguish reduced by various treatments later relapse.

Some mental patients lose their anguish spontaneously, that is, for no known reason. Others lose it after operations in which nerve paths in the frontal lobes of the brain are cut. Some lose it after insulin, metrazol

and electroshock treatments. Injection of certain barbiturates into the veins relieves the anguish of mental patients for short periods. Psychiatric treatment sometimes relieves it.

But the anguish may return. If it does, it is not any different a feeling than it was originally. The same is true for patients whose intractable pain has been relieved by the frontal lobe operation. A second operation or some other kind of treatment may relieve the relapse.

For these reasons, Dr. Landis thinks anguish is related not to a special part of the brain but to a special sensitivity of it to a substance in blood. He reports his theory and suggests some special studies in the *Journal of Nervous and Mental Disease*.

Drunken Driving Test

➤ MASS TESTING to detect drunken drivers is the promise of a 25-minute, two-step test reported by Dr. Irving Sunshine and Robert Nenad of Western Reserve University and the Cuyahoga County Coroner's Laboratory, Cleveland, at the meeting of the American Chemical Society.

As many as 24 persons have been tested within two hours, the scientists reported. In checks for accuracy, it was shown that the method detects as little as two parts of alcohol in 10,000 parts of fluid, either blood or urine, being examined.

The test depends on alcohol turning a solution of potassium dichromate green. In the first step the fluid being tested is put in the outer part of a "Conway" cell. This is a small porcelain apparatus resembling a covered saucer. Two chambers, one within the other, make up the bottom of the cell. The potassium dichromate solution is put in the inner chamber. The whole thing is then heated for 20 minutes at close to boiling, 90 degrees Centigrade.

This evaporates any alcohol present, making it pass into the inner chamber, there to turn the dichromate solution green.

The second step consists of removing the green solution and determining the amount of alcohol absorbed by the dichromate. This can be done either by an electric-eye device or by comparing the green color to that of standard solutions of known alcoholic content.

Low Pressures Prevent Corrosion

➤ WHEN LIQUIDS are concentrated at low pressures and temperatures, their corrosion rate on the still often is reduced materially, E. J. Kelly of the Carrier Corporation, Los Angeles, has reported to the American Institute of Chemical Engineers.

By using low pressures, water can be driven from the liquid at low temperatures. Since many chemicals are less active when cold, corrosion, and in many cases scale-formation, can be cut.

Promising Drugs Aid Against Malaria

New Antimalarial Treatment

➤ AN ANTI-MALARIA drug more powerful than any yet known was reported by U. S. Public Health Service scientists at a recent meeting of the American Society of Tropical Medicine and Hygiene.

There is hope in some quarters that this drug, Daraprim, might completely eradicate malaria, the world's Number One disease problem.

Even the conservative Public Health Service scientists say that a person could, if he took this new drug, go into a region heavily infested with malaria and never come down with malaria while there or after leaving the region.

Prisoner volunteers at the U. S. Penitentiary in Atlanta, Ga., who were given this drug after being bitten by malaria-infected mosquitoes showed no signs of getting malaria as long as a year after being infected.

The drug is called Daraprim by its manufacturers, Burroughs Wellcome and Co. Its scientific name is pyrimethamine. It was made by Dr. George H. Hitchings of the Wellcome Research Laboratories at Tuckahoe, N. Y., in the course of a search for antagonists to nucleic acids. First news of it came in April, 1950, in a report of mouse tests of Daraprim and related chemicals announced at an American Chemical Society meeting.

The drug was then "kept under wraps" while undergoing tests in mice and birds by Dr. Ian M. Rollo of the Wellcome Laboratories of Tropical Medicine in London, England, and subsequently by the following U. S. Public Health Service scientists: Drs. G. Robert Coatney, Albert V. Myatt, Thomas Hernandez, Geoffrey M. Jeffery, W. Clark Cooper, Joseph Greenberg and Helen L. Trembley.

Daraprim is 12 or more times as powerful as chloroquine, standard antimalarial drug used as a suppressant to keep our fighting forces from getting malaria while serving in Korea or other malaria regions of the world. In the tests with prisoner volunteers, 25 milligrams weekly was as effective in suppressing malaria as 300 milligrams weekly of chloroquine. Even this small 25-milligram dose is probably more than is needed to supress malaria. And, unlike chloroquine, Daraprim does a complete suppressing and curing job. Men taking chloroquine alone come down with malaria, if attacked by the relapsing form, after stopping the drug. Primaquine, recently developed, can be given to prevent these relapses. But Daraprim does the whole job alone. Primaquine cannot do this because primaquine is too toxic to be given over a long period as a suppressant.

Daraprim is odorless and tasteless. It does not discolor the skin. It comes in a white tablet somewhat smaller than an aspirin or empirin tablet. It is a cheap drug, both because it is inexpensive to manufacture and because

it is so powerful that a little goes a long way. These features promise great advantage for public health programs in India, Africa and other regions where hundreds of millions are continually drained of health and strength by malaria.

The tests reported by Dr. Coatney and associates were made first in bird malaria. These were a repeat of the tests made in London. Satisfied that the new drug did indeed have "unbelievable" potency as an antimalarial, Dr. Coatney and associates launched the tests with prisoner volunteers in Atlanta similar to those made by the same group in the development of primaquine.

These tests gave the new drug a rigorous trial, since they were made against the Chesson strain of malaria. This is a southwest Pacific strain known as a particularly "tough" one. White men infected by this strain are very sick, with fever of 105 degrees Fahrenheit and vomiting for hours and hours.

The Public Health Service scientists also made tests to see whether the malaria parasites might develop resistance to Daraprim. This was possible under hospital and laboratory conditions, the tests showed, and the resistance could be transmitted by mosquitoes. But the curative dose was so close to that at which resistance could be induced that it was considered unlikely resistance would be a deterrent to use of the drug.

As treatment for an acute attack of malaria, Daraprim was effective but took longer to act than chloroquine.

While these tests were going on in the United States, English researchers were testing the drug in Africa. These give hope that by treating the population through one or two rainy seasons, the disease can be eliminated. In one of these studies in an isolated village, every person was treated at the time when most of them would be infected with malaria. The human population was cured in about two months and the mosquitoes, which would have picked up the infection, were also kept malaria-free. In a bag of 100 mosquitoes at a time when all should have been carrying malaria germs from the people they had bitten, not one mosquito was found with the parasites in its body.

The new drug is on the market in London but not, as yet, in the United States.

While malaria is no longer a problem in this country, the new drug may nevertheless prove life-saving for American babies afflicted by a relatively new and generally fatal disease called toxoplasmosis. In tests with mice Dr. Don E. Eyles of the Public Health Service found Daraprim combined with sulfadiazine produced more cures than any drug regimen tested to date.

Vegetable oils may become more important than petroleum in the economy of the Southwest; they come from crops which are renewable each year while petroleum comes from a source that can not be replenished.

Glass as an engineering product can be made lighter than cork and almost as heavy as iron; it can be made in mechanical strength stronger than cast iron.

Studies Show Origin Of Soot and Fumes

Homes Share Blame For Smoke

➤ NEW TECHNIQUES for sampling the air we breathe to evaluate its health hazards are being developed at the University of California at Los Angeles.

Albert Bush, assistant professor of engineering, is seeking the answer to such questions: "Do size, structure or number of certain particles in the air constitute a hazard?" and "Where do such hazards originate?"

Preliminary research has been concerned with developing techniques for evaluation of atmosphere in particular places. Samples of particles in the air have been collected by instruments designed for the study and examination of the samples under the electron microscope.

Los Angeles air has yielded a multitude of varied specimens for study. They range all the way from virus-like matter to star-shaped crystals.

One phase of the investigation revealed that Los Angeles municipal incinerators discharge 1,000,000,000,000,000 particles into the atmosphere per ton of refuse burned.

Microwaves Measure Smoke

➤ MICROWAVES now can be used to measure tiny amounts of smoke in the air as well as to carry television programs from coast to coast.

Under an Army Chemical Corps grant, Prof. H. C. Thacher, Jr., of Indiana University, and graduate student Paul B. Dorain have adapted a machine which pipes the ultra high frequency radio waves into two test chambers. One chamber is filled with pure air. The other contains air with traces of smoke.

Traveling at different speeds through the two different air samples, the microwaves reveal the amount of smoke in the impure air. The instrument's sensitivity permits it to measure as little as six hundred-thousandths of an ounce of smoke in a cubic foot of air.

The smoke-measing machine was adapted from a device originally developed at the National Bureau of Standards by George Birnbaum.

Sill Dust Not Smoke

➤ DON'T JUDGE a smoke stack by the smoke you see coming from it. The chances are that such smoke, thick as it may look, is not what makes dust fall on your window sill.

This advice, in effect, was given by W. C. L. Hemeon, engineering director of the Industrial Hygiene Foundation, Mellon Institute, at the Foundation's annual meeting.

Scientific methods must be used to determine whether or not a given stack is polluting the air and soiling homes, shops and other buildings in the neighborhood, Mr. Hemeon declared.

Fine particles, from improper burning of coal or other fuels, are the ones you see as they leave the chim-

ney. They can be seen because of the light scattering power characteristic of all very fine particles. These fine particles are responsible for visible haze over a city. As they are slowly and imperceptibly deposited on ceilings and walls, they gradually stain these surfaces. The stain will be black if the particles are from coal smoke.

But the coarse particles that settle fairly fast on porches, sills and other outside objects are practically invisible when the come out of the chimney. They cause the nuisance called "dust fall," but do not add to the visible haze over a city.

In most cities where a coal-smoke, wall-staining problem exists, it is caused by smoke from domestic furnaces, Mr. Hemeon said. This is clear from the fact that it is almost completely absent in summer. Dust fall nuisances, on the other hand, almost always come from industrial operations.

Technological improvements, Mr. Hemeon pointed out, have had far greater effect in reducing air pollution than laws. Among such improvements he listed diesel engines instead of steam locomotives and improved combustion equipment in factories.

Dwellings Add Smoke to Air

➤ SMOKE from the chimneys of individual dwellings and small apartment houses often does more to pollute the neighborhood atmosphere than the smoke from the factory stacks in cities where coal-burning furnaces are widely used.

This is in spite of popular belief to the contrary. Smoke from factory stacks is denser and more concentrated than that from ordinary dwellings, and therefore more visible. But the total discharged may be much less than the output of the many private houses in the region.

This is the opinion of Dr. Walter C. McCrone of the Armour Research Foundation of Illinois Institute of Technology. At a recent meeting of the American Meteorological Society, he discussed the air pollution problem of Chicago. What is true for that city, however, is true for many others.

Dust, fumes and haze all contribute to this city's air pollution. Stacks and chimneys are the prime sources of settled dust, he stated. Settled dust contains fly ash from the chimneys, dust and dirt blown from streets and vacant lots, paper, cloth, decay of buildings and mineral constituents of the soil. It may also contain materials blown in from areas outside of the city.

Fumes are gases, such as hydrogen sulfide, oxides of sulfur, oxides of nitrogen, hydrogen fluoride, carbon monoxide, and complex odoriferous compounds from stockyards, animal-rendering plants, paint manufacturers, and burners of high sulfur coal or oil.

Haze is made up of fine droplets of moisture, which often contain dissolved gases, such as the oxides of sulfur and nitrogen. These droplets are actually sulfuric and nitric acid solutions, and are not only injurious to nylon stockings but also may shorten the life of human beings in daily contact with them.

No Quick Solution Seen

➤ NO QUICK solution to annoying air-pollution problems was foreseen by Allen D. Brandt of the Bethlehem

Steel Co., addressing the American Society of Mechanical Engineers meeting. A certain amount of air pollution is the price that must be paid for those many conveniences which are the product of an industrial giant (the United States), he stated, and this condition requires a long time to correct.

About $100,000,000 already is being poured annually into corrective measures to make the air less contaminated. Effects of the control measures are beginning to show. Despite increased employment and production, air pollution due to dust and sulfur dioxide is on the downgrade.

Industries are cutting air pollution by substitutiong machines that release few objectionable contaminants into the air for machines that expel many air-polluting wastes.

Other industries are converting their wastes into by-products. Horrible-smelling hydrogen sulfide can be converted into sulfur dioxide, and that can be made into sulfuric acid. Poisonous carbon monoxide can be burned into harmless carbon dioxide.

Still other industries are filtering the solid polluting products out of waste gases by machinery, or are building tall smokestacks that will disperse waste gases high into the atmosphere where they will not be objectionable.

Library Fire Preserved Clay Books

➤ EVIDENCE of a fire in a library which not only did not destroy the books but actually helped to preserve them, was reported by Dr. Carl W. Blegen, archaeologist of the University of Cincinnati.

The fire occurred in the palace of King Nestor in ancient Greece some 3,000 years ago. The books were records inscribed on clay tablets which were baked hard by the heat and flames. The inscriptions were the first known European writing, Dr. Blegen, said, and were in a script which has not yet been deciphered.

Other interesting finds at the site near Pylos, about 225 miles southwest of Athens, were signs of a balcony indicating a two-story construction in the luxurious palace, built seven centuries or more before Greece's classical "Golden Age." The palace also had fluted columns.

The palace was built of stone, crude brick, plaster and wood. It was probably stucco-faced and possibly was decorated with paintings. The great hall, 36 by 42 feet, had a central hearth 13 feet across decorated in geometric patterns in at least three colors.

Dr. Blegen believes the palace may have been burned down by invading tribes from the north some years after the death of King Nestor. This king, known as "Smooth tongued Nestor," was one of the leaders in the Trojan War.

The consumption of food resulting from the use of new chemicals in crop production has not created mysterious diseases and epidemics or endangered the health of people.

Virus Seizes Cell Prey By Radicals on Its Surface

Ions Bind Virus to Cell

➤ A BACTERIAL virus takes hold of its cell victim by means of particular chemical groups of atoms on the cell's surface. This strategy in submicroscopic germ warfare has been discovered by Drs. L. J. Tolmach and T. T. Puck of the University of Colorado Medical Center. They report their discovery in the *Journal* of the American Chemical Society.

Two viruses, T1 and T2, labeled with radioactive phosphorus were studied in their combinations with a culture of a colon bacillus, named E. coli B, in the experiments of the Colorado chemists. They treated the bacillus cells with a number of chemical reagents to modify their chemical structure. They then traced the effect on the cells of adding one or the other of the labelled viruses.

Although the radioactive phosphorus in the structure of the virus permitted it to be followed and its fate learned, the results obtained by Drs. Tolmach and Puck rule out the possibility that phosphoric acid plays an important part in the combination of virus and cell.

Other chemically reacting structures in the cell which these scientists expected to take part in attachment to the virus are the carboxyl, the amino, the sulfhydryl and the phenolic-hydroxyl groups. Between these, the tracer experiments of the Colorado scientists decided in favor of the first two.

The two types of virus used by the experimenters are not alike in their method of seizing their prey, Drs. Tolmach and Puck report. Virus T2 appears to demand that the cell with which it combines have an intact carboxyl group, the essential structure for an organic acid. It is indifferent to the presence of amino groups in the cell molecule. Virus T1 insists upon the presence of one or more amino groups, but is not so particular about carboxyl groups. The specific nature of these combinations is believed by these experimenters to be characteristic of the way organisms can be resistant to some viruses and susceptible to others.

Ionic bonding, which is mainly responsible for chemical combinations among inorganic chemicals, rather than the weaker kinds of association often found between organic chemicals, seems responsible for combinations between virus and cell, according to Drs. Tolmach and Puck, although they do not rule out other kinds of chemical forces.

The difference in the chemical behavior of the cell with the two kinds of virus, according to the Colorado chemists, is evidence of the blocking of specific chemical groupings on the cell surface, rather than random disorganization of cell structures.

Nickel is most generally used as an alloying element.

New Federal Report Shows Need of Mineral Stockpiles

Vital Material Sources Surveyed

➤ AMERICA today produces only about two-thirds of the lead it uses annually, very little of the nickel it consumes, about 40% of the antimony needed and less than 8% of the noncombustible asbestos which has many strategical applications.

These figures indicate the importance of stockpiling certain essential minerals which the United States does not mine in sufficient quantities to meet war and peacetime needs, but must rely on importations from foreign countries. They are taken from a four-volume report of the U. S. Bureau of Mines to the National Security Resources Board which now is available to the public.

Each of the four volumes covers one mineral. They are all entitled Materials Survey, one being Lead and the others, Nickel, Antimony and Asbestos. They are obtainable from the Superintendent of Documents, Washington, D. C., the cost being $3.50, $2.00, $1.25, and $1.75, respectively.

The volumes are world-wide surveys of the industries, describing the minerals and ores of commercial interest, the methods of mining, smelting and refining, uses and possible substitutes. Output by each producing country is included and of particular interest are sections dealing with the producing facilities and ore reserves of various nations.

Lead production in the United States up until 1936 met the country's needs. Importations began then but did not become of real importance until 1940. Production from American mines is not much less than back in the decade preceding World War II, but consumption has greatly increased. The storage-battery and cable-covering industries are the largest users of lead, but there are many other important uses and lead in tetraethyl anti-knock fluids now accounts for 10% of the annual consumption.

The United States consumes 68% of the new nickel produced each year in the world, but mines very little. Fortunately, nearby Canada is a heavy producer of nickel. It mines approximately 90% of the total production outside of the Iron Curtain. Cuba also has large nickel reserves which will become available when economical methods are developed to recover the iron and chromium by-products found in its nickel ore.

America is also the world's largest user of antimony, a metal of great importance in industries although not as well known to the public as many of the more common metals. It consumes about 34% of the Free World production. China for years was the world's greatest producer, but this source is no longer available except to the Reds. Antimony has many uses, particularly in alloys. One of the most important single uses is in antimonial lead for storage batteries.

The United States has developed

the greatest asbestos-products industry in the world, although it imports most of the raw materials. The products are used wherever fire resistance is essential, but there is no known substitute for asbestos used in steam packings. More important is its use in automotive brake lining and clutch facings. For these purposes no substitute is known and without efficient brakes and clutches the motor vehicle is of little use, either in peace or war.

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➤ "WELL, *I got us out of chemistry class early again!*"

Space Conditions Studied; Rocket Travel Improved

Engineers Survey Space Travel

➤ SCIENTISTS will have to find answers to many perplexing questions before you can jump into a sleek rocket ship with a round-trip ticket to the moon.

Heinz Haber, associate physicist at the University of California, Los Angeles, told the American Society of Mechanical Engineers at the Centennial of Engineering, in Chicago, that space travel poses numerous physical and psychological problems requiring more study.

Moderately large meteors could puncture the hull of a high-flying ship easily, he said. That could result in an immediate "explosive decompression of the crew."

Present-day airplanes are not troubled by meteors because most of the particles from space vaporize at great altitudes as they whiz into the earth's atmosphere. Most of them waste away completely by the time they have fallen to a 60-mile altitude. But at 90 miles, a rocket ship would run the same risk of being meteor-struck as when it is in interplanetary space, except for the protection offered by the earth.

The heat generated by air friction, by the sun and by the men inside the ship creates another problem. If the rocket ship's cooling system failed, the inside heat would rise rapidly. Men would collapse in an hour at a temperature of 185 degrees Fahrenheit. It would take only three minutes if the temperature swiftly rose to 500 degrees.

Mr. Haber said cosmic rays would be a health hazard at 13 to 23 miles. Estimates show a cosmic ray concentration great enough to be considered harmful to body tissues.

A blanket of ozone surrounding the earth between nine and 25 miles high normally protects earthmen from excessive quantities of ultraviolet light. When the rocket ship passed that blanket, ultraviolet rays would become harmful to skin and eyes unless protective measures were taken.

The ozone itself could be toxic if too much of it got into the cabin air. But just as special window materials can screen out ultraviolet light, so special filters can keep ozone from entering the rocket ship, he said.

Weightlessness would occur when the rocket ship reached an altitude of 50 or 60 miles. Experiments have shown, however, that weightlessness merely creates slight disturbances in circulation and breathing. Its most pronounced effect would be felt when passengers started to walk around, to pick up things or to coordinate body movements with their sense of touch.

Mr. Haber said litt'e definite knowledge exists of the psychophysical consequences of weightlessness. He said this offers one of the biggest challenges in space-medical research.

One Thousand Miles Up

➤ MULTI-STAGE research rockets should roar 1,000 miles into space within the next five years, and single-stage

rockets should climb to altitudes exceeding 500 miles.

Reporting to the American Society of Mechanical Engineers during the Centennial of Engineering, Milton W. Rosen and Richard B. Snodgrass, both of the Naval Research Laboratory, Washington, D. C., said that sounding rockets are the ancestors of future space vehicles, but not the immediate ancestors.

The Wac Corporal, Viking and Aerobee sounding rockets used in scientific research already have carried seven tons of instruments 140 miles into the sky. German-developed V-2 rockets have lifted 20 tons of instruments to similar heights.

But the scientists said it is too early to discuss specific designs for manned satelites and space ships because researchers have only begun to investigate the problems of keeping humans alive outside the earth's atmosphere.

Synthetic vs. Natural Fibers

➤ A WAR of the fibers is on. New synthetic textiles have their backers. Traditional cotton, wool and silk have theirs. Unique usefulness is claimed for the new fibers. Champions of cotton, wool and silk say these old, dependab'e fibers will always meet the major needs of most people.

Dacron, orlon, nylon, acrilan and dynel are the truly synthetic fibers, Joseph B. Quig, manager of textile research for the Du Pont Company's Textile Fibers Department, reported to the American Chemical Society in a recent round-up of information.

Vicara, said Dr. Quig, the fiber made from zein, the protein of corn, has many qualities which relate it to that group.

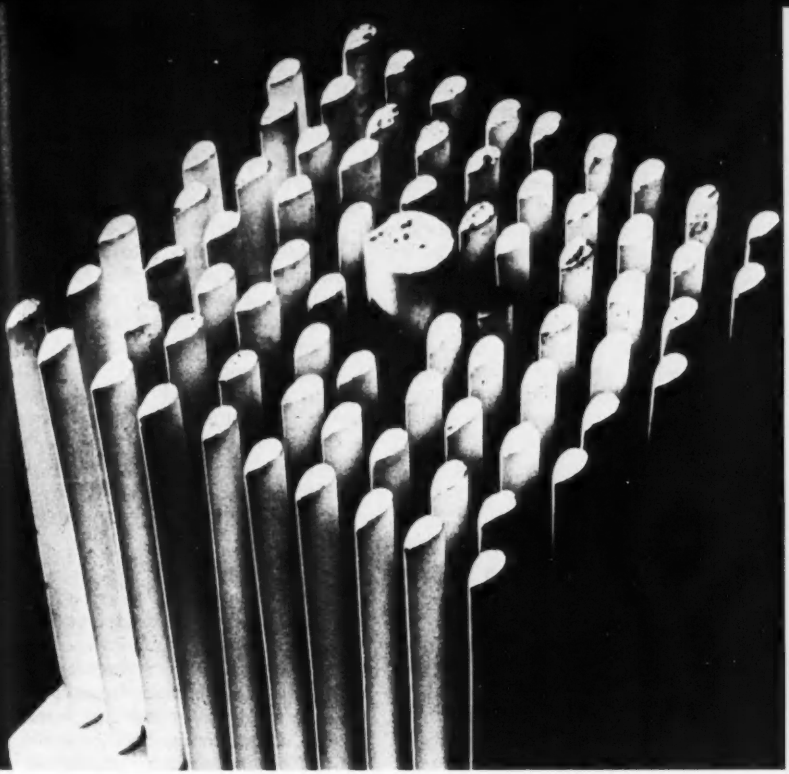
Dynel resists chemicals and flames. Acrilan and orlon resist sunlight, and have exceptional bulk. Dacron's resilience and ny'on's strength will win special places for them in clothing, said Dr. Quig. He believes that the new synthetics have introduced a new dimension into fabrics.

"Viscose rayon is still king of manmade fibers," said Julius B. Goldberg, director of research of J. P. Stevens and Co., New York. The fact that about a billion pounds of viscose rayon are used per year in the United States is proof in his opinion that in both quality and price this material meets the needs of the people.

Acetate enjoys a price advantage among fibers, said Ashton M. Tenney of A. M. Tenney Associates, New York. There have been recent improvements in dyeing and finishing acetate fiber.

On the side of traditional textiles, Werner von Bergen of Forstmann Woolen Co., Passaic, N. J., defended wool as essential for winter-weight fabrics, L. K. Fitzgerald of Dan Rivers, Danville, Va., praised cotton as the "work-horse" among fibers, and W. S. Kilborne of William Skinner and Sons, New York, outlined the way scientific thinking should be applied to the problems of silk.

America produces as much steel each year as all the other nations of the world combined.



➤ PORCELAIN RODS *of tear-drop cross section which, when coated with a catalytic agent made of alumina and platinum, will become one unit of a new Houdry oxidizing catalytic installation. Combustion of waste gases occurs at the coated surface of these rods.*

Catalyst Makes Heat From Wastes

➤ A WASTE-BURNING catalyst which attracted attention by running an Allentown, Pa., plant on its own smells, has now been applied in the oil refining industry to make steam and electricity.

Ultimately expected to save money in salvaged wastes and to eliminate air pollution at the same time, the catalyst has been pronounced a success by the Sun Oil Company.

Waste carbon monoxide and hydrocarbons, blown out of petroleum-cracking reactors at Sun in a continuous stream, are burned as they pass through the catalyst. Eighty per cent

of the heat is converted to steam, the remainder, through a gas turbine, to electric power.

The new oxidation catalyst, basically of catalytic alumina and platinum alloy, was developed by Eugene J. Houdry, French-born dean of catalytic scientists and creator of the Houdry process of catalytic cracking of petroleum.

The unit, measuring five and a half inches long, three and one-eighth inches high and three inches wide, is made up of two thick porcelain end plates and, between them, a porcelain spacer bar and 73 coated porcelain rods. Gases flow across the rods, each tear-drop in cross-section so as not to disturb the flow. The combustion occurs at the surface of the rods where they are coated with a .003 inch film of the catalytic agent—the catalytic alumina and platinum alloy.

The catalytic elements at the top of the reactor are arranged in five layers of 500 each.

The bulk of the heat created by the oxidizing catalyst is carried off by molten salt in pickup tubes to make steam used for a variety of purposes at Marcus Hook. The balance of the heat increases the temperature of the flue gas driving a gas turbine, resulting in an additional production of power. This turbine, in turn, drives a compressor which forces 40,000 cubic feet of air a minute at 50 pounds pressure per square inch through the cracking unit to regenerate the cracking catalysts.

Industrial Explosives

➤ THERE IS a lot more "bang" in American industry than is generally appreciated, and over 700,000,000 pounds of explosives are manufactured each year to supply the "bang."

Armies consume great quantities of explosives in wartime but industry employs them at all times. Meeting this industrial demand is the big part of the work of the chemical manufacturers who turn out explosives from gunpowder to trinitrotoluene.

Each year the use of industrial explosives seems to be increasing. During 1951, a total of 753,820,583 pounds were used, according to a recent report of the U. S. Bureau of Mines. This is a 5% increase over 1950. Coal mining consumes about 39% of the total. Figures for 1952, while not yet available, undoubtedly continue the trend.

Mining uses a very large percentage of the industrial explosives manufactured but a considerable amount is used in construction work and a variety of other activities from ditch-digging to stump-removal. Metal mining, and quarrying and non-metal mineral mining, each use about one-fifth the explosives produced. Railway construction is a heavy user. Wherever earth and rock must be removed, blasting makes the handling easier.

The Bureau of Mines, after long testing with various explosives, urges the coal industry to use types designated by it as "permissible" because they provide less hazard. However, in 1951 approximately 52% of the high explosives used in coal mining was not of this type. Approximately 37% was of the permissible type, 4% was black blasting powder and about 7% was liquid oxygen explosives.

For the Home Lab

Malachite Green

by Burton L. Hawk

➤ It has been quite a long time since we have considered a coal tar dye. So, without further ado, let us proceed with the synthesis of Malachite green.

First, we need 3 cc. of *freshly distilled* benzaldehyde. Use care in performing this distillation. It might be a good idea to add a few pieces of porcelain plate or glass beads to the benzaldehyde in order to prevent "bumping" and uneven boiling.

Next, we must prepare *anhydrous* zinc chloride. Place 5 grams of the compound in a large porcelain evaporating dish. Heat gently at first with constant stirring. Gradually apply more heat and finally enough to melt the compound. Continue to heat for a few minutes, then cover the dish with a glass plate and allow to cool. Add to the cooled zinc chloride, the 3 cc. of freshly distilled benzaldehyde prepared above along with 6 cc. of dimethyl aniline. Heat the mixture on the steam bath for 90 minutes.

You can devise your own "steam bath" by using a large beaker on which the evaporating dish can set comfortably, on top, without falling in. Fill the beaker half full of water and heat. The steam from the boiling water will heat the dish. Of course, arrange the dish so that the lip of the beaker remains open to allow excess steam to escape. Cover the evaporating dish with a glass plate. Stir the contents frequently during the heating and if the mixture becomes too thick, add a little hot water.

The product we obtain is known as the *leuco-base* of Malachite green, or, if you prefer, tetramethyldiaminotriphenylmethane. Our next step is to convert it to the carbinol (color) base by oxidation.

Dissolve the residue in a solution of 3 cc. hydrochloric acid and 6 cc. of water. Transfer the liquid to a large beaker. Add 100 cc. of water and about 20 grams of cracked ice. Now prepare a suspension of lead dioxide, PbO_2, by vigorously shaking 2 grams of the powder in 15 cc. of water. This is our oxidizing agent. Add it to the beaker slowly, in small portions, stirring continuously.

The next step is to remove the lead. This is done by adding a solution of 2 grams of sodium sulfate in 10 cc. of water. Filter off the resultant lead sulfate.

Malachite green is usually precipitated as the double salt of the hydrochloride and zinc chloride.

Add to the filtrate a solution of 3 grams zinc chloride dissolved in 15 cc. of water followed by 12 grams of solid sodium chloride. Stir thoroughly for a few minutes. Filter off the green crystals and carefully dry. If you have worked carefully, you should have a yield of about 3 grams.

Now that you have obtained Malachite green, are you prepared to dye?

As you have certainly observed by now, the dye is an intense blue-green color—and a little goes a long way. It is a basic dye and will dye wool and silk directly. However, in order to dye cotton, the cloth must be mordanted first. By "mordanted" we mean treated with a substance ("mordant") which is taken up by the fibers of the cloth. The mordant in turn takes up the dye. Thus I suppose you could say that we actually dye the mordant, not the cloth. But who knows the difference!

Prepare a solution of Malachite green by dissolving a small quantity of the powder in water. Heat to boiling and immerse a piece of wool or silk in the hot solution for several minutes. Remove and wash with water. The cloth is dyed a deep blue-green. This process is known as *direct* dyeing.

If you will perform the above operation with cotton you will find the color is not fast. To dye cotton preliminary treatment with a mordant is necessary. This process is known as *mordant dyeing*. (For best results with cotton, it is advisable to boil it for 10 minutes in a solution of one gram sodium carbonate in 500 cc. of water and then rinse several times in clear water, before attempting to dye it.) Dissolve a very small quantity of tannic acid (about 0.2 g.) in 100 cc. of water. Heat to boiling and immerse a piece of cotton cloth in the hot solution for several minutes. Remove the cloth, press it with a spoon to remove excess liquid, then immerse for several minutes in boiling Malachite green solution. You will note this time that the dye is fast. To make the color somewhat darker, the tannic acid may be fixed to adhere more strongly to the fibers. This is done by dipping the cloth in tannic acid as before and then immersing in a solution of tartar emetic for about 10 minutes. Use about 0.2 g. of tartar emetic dissolved in 200 cc. of water.

Malachite green is converted into a colorless compound by reducing agents. This can be demonstrated by adding a solution of sodium bisulfite to the dye. Incidentally, this is a good method of removing the dye from your glassware . . . (or from your hands?)

Well, we hope you have enjoyed dyeing. If so, we must dye again some time.

New Electrical Superconductors

▶ Discovery of six new compounds that are superconductors has been reported by two scientists who worked at the University of Chicago.

Superconductors show an abnormally high electrical conductivity when cooled down near the lowest temperature believed practical, about 459 degrees below zero Fahrenheit. Dr. B. T. Matthias now of Bell Telephone Laboratories, Murray Hill, N. J., and Dr. J. K. Hulm of the University's Institute for the Study of Metals report in *Physical Review* that they tested about 90 compounds to find the six new superconductors. Of the six, two are nitrides, two are borides and two are alloys of metals.

The manufacture of sulfuric acid consumes three-fourths the sulfur produced in the United States.

State of Chemical Literature: What the Educators Want

Books on Chemistry

by A. H. BLATT
Queens College, Flushing, N. Y.

An address presented at the annual meeting of the American Institute of Chemists, reprinted from "The Chemist."

➤ THE TEACHER of chemistry in the college or university is by the nature of his work to be described either, favorably, as a jack of several trades, or unfavorably, as a personality split several ways. His primary responsibility is teaching chemistry and training chemists. In addition, to an extent depending upon his own temperament and upon the character of the institution of which he a part, he will be concerned also with the development of his students as persons and as future citizens. As a teacher he has the responsibility of keeping well informed about the status of and developments in the whole of chemistry —not in just the restricted portions of the subject in which he has particular interest. Ideally, of course, the teacher of chemistry also keeps informed of developments in related sciences, physics on the one side and biology on the other. The practical difficulties here, resulting from the enormously increased volume of material being published and from the failure of any one to figure out how to increase correspondingly the number of hours in the day, have been and will be dealt with by other speakers.

Finally the teacher of chemistry will also be doing research, either doing the research himself or *via* the medium of graduate students and post doctoral fellows. The many other activities that take up the teacher's time, for example, serving on committees and manoeuvering so as to avoid being put on committees, are not relevant to our discussion.

For each of the three relevant functions—teaching, keeping informed of developments in chemistry and related subjects, research—the teacher has need of books. For research, however, the teacher's need of and interest in books are identical with those of other research chemists.

As a teacher the academic chemist will need textbooks. This statement I must qualify by limiting its application to the first courses in the various areas of chemistry; for example, the first year's work in general chemistry; the first year's work in organic chemistry; the first year's work in physical chemistry. I shall have a word to say about textbooks in advanced courses later, but the discussion of textbooks that follows immediately refers to these first courses.

What do we want of textbooks? Let us begin by being completely practical. We want the textbooks to be reasonably priced. The student takes several courses in any one semester. In some courses there will be laboratory manuals as well as textbooks

required. When the prices of these books mount to between five and ten dollars each, the total cost becomes a real problem. I know that the publishers are doing what they can to meet the problem of rising costs. You will doubtless hear more on this problem later when we hear from the publishers. All I need do is point out that the price of textbooks is a serious problem.

Closely related to the cost of textbooks is their size. From my own experience I can assure you that it is more difficult to write a short book than a long one. The temptation is to include more and more material. I feel strongly, however, that the author should not evade the responsibility of making decisions as to what is important and what is not by including everything that might be of interest to every teacher who may use the book. Some textbooks are quite unrealistic with respect to size; a book that contains 800 to 1,000 closely printed large pages is too big for use in a course that meets three times a week for an academic year—roughly between seventy and eighty class meetings when you allow for holidays and examinations. You sometimes find in addition "Suggested Readings" at the end of each chapter which will run as high as 300 pages and which may involve one or two languages in addition to English. One wonders whether the author has given thought to the facts that the student is taking at least three and usually four other courses at the same time and that the particular course for which the textbook was written is not the only interest in the life of the student—though it may be for the author.

The reverse of the textbook that is too large and too inclusive is the textbook that is built too closely upon the course given by the author. Good textbooks are not written by someone who decides one day to write a textbook and thereupon does it. A good textbook develops from a good course and it represents the author's accumulated experience about effective ways of organizing and presenting the material involved. But it must be remembered that what is the best course for one instructor is not the only course and may not be the best course for another instructor. In other words the textbook should be an aid to the instructor, not a substitute for an instructor. Stated somewhat differently, the textbook should reflect the author's experience and at the same time give adequate freedom to the instructors who use it. The limits between which the author works follows from what has been said: he must avoid making the textbook too restrictive on others and he must avoid making the textbook so generally applicable that it becomes characterless.

Implicit in what I have been saying are some ideas of the way in which a textbook is to be used. Any adequate discussion of this point would take us too far afield and would require much more time than is available, for the ways in which textbooks are used will vary with the course, the instructor, and the institution. The one use of the textbook that I believe is common to all instructors should, however, be mentioned. The textbook frees the instructor from the necessity of reciting a body of experimental observations and descriptive material and provides the student with a convenient reference source for this information. In this way the instructor is free to spend more time

on topics which, from his experience, he knows require repetition and exposition from more than one point of view.

It is important that the textbook represent a certain amount of scientific maturity on the part of the author. He should recognize the relationship between experiment and theory, he should be aware of the distinction between theory and rationalization, and he should realize that the student may not recognize and be aware of these relationships and distinctions. Another aspect of this same requirement is that the textbook should make clear that chemistry is a living and growing subject, not one that is complete and static. It is most unfortunate when a student gets the impression from his first text in a field that we all know all the answers, and then finds in an advanced course that we know very few.

Such obvious requirements of a good textbook as that it be reasonably up to date and free from serious inaccuracies I need only mention before passing to the advanced courses—those courses customarily listed in university catalogs as open to properly qualified seniors and to graduate students. I feel reasonably certain from conversations with publishers' representatives that the publishers will not agree with what I shall have to say. For, excepting skill courses where procedures and methods must be described in detail, I see little justification for the textbook in an advanced course in chemistry. Or to reverse the emphasis, if you can justify the textbook in an advanced course you will find it difficult to justify the instructor. This does not mean that the advanced course will be given without the assistance of books. Extensive use will be made of advanced treatises and monographs for reference assignments. But the advanced course should be based so largely by the instructor on his own study of original journal articles; and so much of the content of an advanced course should change from year to year as new work is published in the journals, that it is undersirable to freeze the work of such a course into print. The advanced course, in other words, should be too personal an affair and too close to the original publications to justify a textbook.

Finally we come to the problem which the teacher faces in keeping informed of developments in chemistry and related subjects. As you are all aware, the volume of original work has become so large and its content has become so specialized that it is all one can do to follow such work in one field of chemistry, say organic chemistry or physical chemistry. I can recall from my own experience that twenty years ago I could follow *Chemical Abstracts,* regularly read some half dozen journals for their articles on organic chemistry, and in addition, read articles in other fields of chemistry. This I can no longer do. And I don't believe that I read more slowly now than then. For other areas in chemistry than one's field of special interest and for other subjects than chemistry, the teacher is forced to rely on reviews—*Chemical Reviews* and the various annual reviews published in this country; the *Annual Reports* and *Quarterly Reviews* published in England—and on advanced treatises and specialized monographs. The advanced treatises and specialized monographs that are being pub-

lished are, I think, excellent. The difficulty is not in the quality of the books but in their availability. The current inflation has not reached academic salaries or the funds available to college and university libraries. In one recent week I received publishers' notices of four advanced books that I want to read and study and which I should read and study. They were priced, however, at $9.00, $12.00, $16.00, and $17.00 respectively. Now $54.00 is a sizeable book order for an individual, and for a college library as well when it is recalled that similar requests are coming in from others in the chemistry department and from other departments. I personally prefer to have my own copy of a book I want to study rather than to depend on the library, but it is becoming necessary to change my habit and use not only the college library but other libraries as well.

Water-Injection Recovers Additional Oil

➤ RESTORING productivity of oil wells, exhausted by ordinary pumping, to additional production by water pressure was a subject of vital importance recently at the meeting of the American Petroleum Institute. Vast additional quantities of oil can be obtained by water-injection, it was stated, to meet present and future needs in defense and civil activities.

The East Texas salt-water injection program has become the most important conservation measure ever applied to an individual field in the United States, the petroleum scientists were told by Paul D. Torrey, Oil Recovery Chemicals, Austin, Texas.

It is indicated that this program, Mr. Torrey declared, will result in the recovery of an additional amount of oil which will be larger than the combined primary and secondary production of most of the world's individual fields.

In the water-injection method, water under high pressure is forced down a central well to drive oil through the rock formations in which it is deposited to the pumping wells.

In reviewing water-injection projects, Mr. Torrey stated that maintenance of pressure by water injection in fields where the method is applicable will result in increased oil production, much higher rates of production with no damage to ultimate recovery, reduced development costs because of the lower number of wells required, and low production costs resulting from a continued flowing life of the wells until water is produced in substantial quantities.

Unit operations to accomplish maximum recovery of oil and gas from a production pool are adding hundreds of millions of barrels to the reserves of the United States, the petroleum men were told by H. H. Kaveler, Phillips Petroleum Co., Bartlesville, Okla.

Utimate recovery is substantially independent of the well spacing and the number of wells drilled, Mr. Kaveler said. It is time for the industry to wake up to this fact and realize that only pressure maintenance of reservoirs accomplishes maximum recovery.

Planned Industrial Districts Pool Transportation and Utilities

The Big Build-Up

From the Industrial Bulletin, A. D. Little, Inc.

▶ PARALLELING the innovation of the large-scale shopping center is the boldly planned industrial community. Integrated developments now provide manufacturers with land, utilties, sewage systems, transportation, and often multipurpose buildings, and are located logically with respect to the surrounding urban areas and the needs of the concerns attracted to it. Although the concept came earlier than the shopping center, its development did not follow as rapidly, perhaps because the locational advantages, such as accessibility to the customer, are more obvious and compelling to a retailing enterprise than are the benefits to be derived from the industrial equivalent.

Several important industrial districts were started many years ago. Chicago's Clearing Industrial District was established in 1885, for example, but the high level of new-plant investment since World War II has fostered more and more interest in such ventures. The trend has been enhanced also by the Government's industrial dispersion program, announced in mid-1951 by the National Securities Resources Board and executed in part by local officials and civic groups. Several communities were stimulated to act on the problem of industrial location by this program; Seattle is a notable example.

Similarly, many communities, such as Portland, Me., Charleston, S. C., and Providence, R. I., created industrial districts from facilities left idle at the end of the war. The intent was to provide employment on a large scale for former war workers and to attract new industry to maintain employment and income in the community. Encouraged by the success of these efforts, some have gone ahead with planning other similar areas, e.g., Charleston's proposed Bushy Park.

Planned industrial areas have also been encouraged by the slum clearance program under the Housing and Home Finance Agency set up by the Housing Act of 1949, which provides for industrial and commercial use of cleared areas where this seems logical. Included under this program are some of the country's major developments, such as those in Norfolk, Va., Philadelphia, and Chicago. About one fourth of these projects involved industrial planning, but, in general, the industrial use is confined to a relatively small part of the total area, and industries chosen for the projects must conform to a master plan for the area.

Planned industrial districts are sponsored by a variety of agents, public and private, such as chambers of commerce, industrial foundations, railroads, investing and planning companies, and state and regional development councils. Many are sponsored co-operatively; Airlawn Industrial District in Dallas is a good example. The railroad serving this area had no

industrial land to develop, but worked with private investors, landowners, and industrial real estate brokers, and developed a 250-acre planned area for distribution and light industries.

Equally bold in concept, and involving similar big investment, are some of the recent developments which provide office, laboratory, and other non-industrial commercial facilities in a planned area. One example is the Golden Triangle redevelopment in Pittsburgh, where office buildings, park and parking areas, and hotel and recreational facilities are being carved out of, and then integrated into, the city. In a less congested area, 30 miles outside New York City, a vast (27 square miles) area is being planned for suburban office communities, where the non-manufacturing side of industry may operate in surroundings more pleasing to its workers than the city. This may prove to be the most completely planned community project yet attempted, with residential and business areas designed to preserve the natural setting. This again is an example of the trend toward emphasizing location in planning business operations.

Burning Unmined Coal Gives Fuel Gas

➤ SEVERAL YEARS of experimental work at Gorgas, Alabama, gives definite proof that unmined coal can be burned underground in its natural seams and that the gases obtained can be used successfully to operate a gas turbine engine or as fuel to generate steam. The gases may also be used to make synthetic gasoline and fuel oils and to obtain chemicals.

Initial work in this experimental undertaking was begun in the spring of 1947. The entire project has been a joint undertaking of the U. S. Bureau of Mines and the Alabama Power Company. Coal seams of the power company were used. The early work was to determine if the coal could be burned in place without mining, and how the burning could best be controlled. More recent work was concerned with making use of the gases obtained as well as improving burning procedures. Included was the operation of two gas turbine engines.

During the 22 months of the second phase of the project, a total of 10,485 tons of coal, underlying an area of almost two acres, was gasified. Over a four-month period, when 65 per cent of the heating value of the coal was realized, the energy yield was greater than could have been obtained from the coal mineable from the same area under existing mining methods, the Bureau of Mines states. The two gas turbines were successfully operated for approximately 100 hours on combustible gases obtained from the coal.

In burning coal in natural layers under ground, holes are drilled into the coal from the surface and fire started in one. Air or oxygen is forced down this hole to support combustion. The gases of combustion are forced through the coal to the other holes and up to the surface where they are captured. These gases are similar to those obtained in the well-known process of making artificial household gas from coal.

Britain's Chemical Industry

by Dr. J. H. Robertson
Editor of the "Industrial Chemist," London

➤ Britain's chemical industry, already greatly expanded since the end of the war, has plans that will increase the value of 1953 production by 64% over that of the base year 1949.

To achieve this, a capital expenditure of nearly £200,000,000 ($56,000,000) will be necessary, and the labor force must be raised by 25,000.

In view of the industry's post-war record, this aim is not considered beyond attainment. Many products formerly not manufactured in Britain are now freely available. In particular, a whole new petrochemicals industry has grown up which includes such important installations as that of British Petroleum Chemicals at Grangemouth, in Scotland; of Petrochemicals Ltd. at Partington, Shell at Stanlow, and Imperial Chemical Industries at Wilton. The inorganic side has not been neglected, as is evidenced by such ventures as the alkali and chlorine plant of Murgatroyd's Salt and Chemical Company and Fison's factory for triple-superphosphate and other fertilizers. Other important developments include the foundation of an organic chemical industry in Wales by Monsanto Chemicals Ltd., and additional facilities for the production of solvents at Hull, in Yorkshire, put into operation by British Industrial Solvents.

Transcending all these schemes in magnitude is the vast Imperial Chemical Industries project at Wilton on the south bank of the Tees where, up to the present, £17 million ($47½ million) has been spent. At the completion of the second stage of construction, it will have involved a capital outlay of £40 million ($112 million) on a site of 2,000 acres.

On this site, which was formerly farm land, is coming into being one of the world's major chemical-producing centers. Wilton represents a new departure in administrative technique. Unlike the Manufacturing Divisions of Imperial Chemical Industries it does not enter into chemical production; its function is to provide such services as steam, electric power, water and transport required in chemical processing. The manufacturing divisions of the company will erect and operate their own plants and avail themselves of the services provided. Wilton is thus being developed as a gigantic "service station" interlaced with pipe-lines in shallow conduits, roads, and railway tracks.

Some idea of the size of the organization can be gathered from the fact that the estimated coal consumption at the completion of the first stage is 500 tons a day: this will raise high pressure steam which, after passing through back pressure turbines to raise 30,000 kw. of electricity, will be distributed for processing. Other service requirements, for example 42

million gallons a week of cooling water and 5 million gallons a week of purified water, are of similar order.

Wilton is linked with its sister organization, Billingham, by a ten mile long system of pipe-lines which at one place pass through a tunnel under the River Tees. This will enable one of the products of Wilton's catalytic cracker, propylene, together with other hydrocarbons and petrol to be despatched to Billingham while Wilton will, in turn, be supplied with brine from West Durham for the production of caustic soda and chlorine.

This ambitious project was formally inaugurated in September, 1949. At that time two plants were in operation, namely those for the manufacture of Perspex and phenol-formaldehyde moulding powder. Since 1949, eight further plants have been brought either fully or nearly into operation, thus bringing close to completion the first stage of development.

The products now being manufactured are of a diverse nature. Wilton is turning out formaldehyde at the rate of 26,000 tons a year of 37% ethylene, oxide and glycol, "Lissapol" (a synthetic detergent), alpha-naphthylamine, polythene, urea-formaldehyde resins, and olefines from the catalytic cracker. Of these, alpha-naphthylamine is of special importance as an intermediate in the manufacture of dyestuffs.

It is impossible to speak of finality in connection with Wilton. Construction has started on several sections of the second stage of development. Thus a beginning has been made on two further plants for "Alkathene" (polythene), a plant for phthalic anhydride and another for Terylene, a synthetic fiber of such versatility that fabrics resembling either silk or wool can be woven from it. Terylene will come on the market in bulk quantities towards the end of 1954. Plans envisage an annual output of 11 million lb. of this material.

Further expansions at Wilton will doubtless include additional productive capacity for established products to meet increasing demands. But without question we shall see erected at no distant date plants for new products now under investigation in Imperial Chemical Industry research departments which will rival in interest such materials as the plastic polythene, the synthetic insecticide Gammexane (gamma-benzene hexachloride), and Antrycide, a drug for the treatment of sleeping sickness in cattle, all of which were discovered in the company's laboratories.

On the banks of the Tees is coming into being a chemical cosmopolis which shows that Britain's chemical industry is meeting the problems of the post-war world with energy and vigor.

On the Back Cover

➤ ETHYLENE *gas is stored under pressure in these two containers at Wilton Works, in the north of England, where Imperial Chemical Industries, Ltd. are carrying out a £40 million development program. The photograph is by courtesy of the British Information Services.*

Wool Felt Takes Place Among Respirator Filters

Filters Protect From Dust and Vapor

Excerpts from an address on "Felt for Filtration," given by Leon D. Gruberg, consultant to The Felt Association, New York, at the annual meeting of The American Society of Mechanical Engineers in New York City.

➤ FILTRATION is the essential ingredient which is the integrity behind most of the products we use in daily life. There is hardly a product, be it drugs or dyes, edible or inedible, or whether it be in industry, field, home or recreation, that is not at one time or another subjected to a fiiltering process in its evolution from raw material to finished product.

It is interesting to note that the word filtration is derived from the French *filtre,* which in turn can be traced back to the word *filtrum* or felt of medieval Latin. Thus the connection between filtering and felt is by no means coincidental, especially in view of the fact that the first filters were made of felt. Filtration is accomplished through porous media which trap and hold solids from liquids or gases by utilizing a difference in size as the basic principle of operation. In short, the filtering medium must be sufficiently open to permit the liquid to pass through but at the same time dense enough to stop particles in the stream.

Filtering is by no means confined to the separation of solids from liquids. It may involve the separation of particles from gas streams, the entrapment and/or recovery of radioactive dusts, the isolation and filtering of toxic fumes, the entrapment of pollen, as well as many other types of filtration for the reduction of occupational hazards and increased comfort in home, office or factory.

Filtration of suspended particles in gases is a special case having many applications in air conditioning, in safeguarding the health of workers and in the elimination, and sometimes recovery, of fumes and industrial dusts.

Respirator

A good example is a respirator now in common use for the protection of workers against silicosis and other equally dangerous dust hazards. For many years the U. S. Bureau of Mines searched for the ideal respirator and wool felt played an important part in the development of a fully satisfactory unit. The answer to the Bureau of Mines' problem was the discovery that properties of wool felt can be greatly improved by impregnation with solvent solutions of rosins or resinous materials. The preplugging of the wool felt to a predetermined degree by this method creates an electrostatic or physical attraction of minute dust particles in the sub-micron range toward the felt and for the first time in history a 100 per cent efficient respirator having the proper permeability for breathing requirements is now possible. The preplugging of felt for use in respirators, moreover, provides full efficiency right from the start. No

breaking-in is required and the wearer is afforded full protection from the first breath. The importance of respirators cannot be overemphasized, either for workers employed where hazardous dusts prevail, or for the protection of our entire population in the event of emergencies brought on by atomic war.

Dust Filter

Felt for respirators, in combination with certain chemicals, increases the efficiency of the unit many fold. Not so long ago, the American Optical Company and the Pulmosan Company designed a revolutionary filter to protect industrial workers exposed to poisonous and disease-producing particles smaller than 24 millionths of an inch in diameter. This new dust filter—the first of its kind—consists of a highly porous felt pad chemically treated so that its ability to prevent passage of dust is 40 times greater than the same felt untreated. A respirator has been designed to utilize the high efficiency of the new filter which is so versatile it can protect the respiratory system against a combination of all types of contaminating dusts in air. Thus it can be used to protect workers against poisonous arsenic, lead, cadmium and chromium dusts; silica dust responsible for the frequently fatal lung disease, silicosis, and nuisance dusts produced by coal, limestone, iron ore and aluminum operations. The chemically-treated felt filter, one-eighth of an inch thick and slightly more than 5 square inches in area, is the equivalent in dust filtering efficiency of previous untreated filters of the same thickness and 42 square inches or more in area.

Providing respiratory protection against both industrial dusts and organic vapors, such as low concentrations of parathion, a highly toxic and widely used insecticide, the new electrically charged filter consists of wool felt impregnated with a resin in an organic solvent after which it is irradiated by infrared rays. The chemically-treated felt is further activated by mechanically fracturing the resin film coating the fibers of the felt. The effectiveness of the filter, it is believed, stems from the chemical and mechanical treatment which apparently induces electrostatic charges in the wool fibers and their attached resin fragments. These charges attract charged dust particles entering the filter with the contaminated air, thus trapping the dangerous dust particles. The new filter, which has been approved by both the Bureau of Mines and the U. S. Department of Agriculture, protects workers against the following hazards: (1) A combination of all dusts; (2) Light organic fumes, vapors and gases; (3) Acid gases, fumes and mists; (4) Combined acid and organic gases; (5) Low concentrations of ammonia; and (6) Metal fumes as in welding, burning, smelting and refining.

The most important of all dust collection devices pertains to the larger commercial installations in which the objective often is two-fold: First, the removal of dust particles from the air to create improved working conditions, and second, the orderly collection of the dusts for reclamation of costly ingredients or for complete disposal by continuous and automatic methods. One of the newest and outstanding units for this purpose is the filter developed by H. J. Hersey, Jr.,

(U. S. Patent No. 2,495,635)which consists of a wool felt bag and an outside blow-back ring which automatically and continuously cleans the cake forming on the inside of the bag by the blowing of a reverse air stream at given intervals. The Hersey units are already in wide use in pulverizing plants, textile mills and atomic energy installations where they are performing filtration tasks with unprecedented efficiency. The Hersey machine was engineered around a specific grade of wool felt which has a predetermined original permeability, strength and other characteristics.

With hundreds of Hersey units already installed, this filter is coming into increased use in the following fields: abrasives, carbon black, chemicals, coiton and woolen textiles, flocking, flour, grain milling, insulation, jewelry, leather, metal finishing, paint, paper, pigments, plastics, power stations, pulverizing, refractories, rubber, shoes, silverware, stone cutting and finishing, wood, woodworking and many others where damp or dry dusts are encountered.

Where felt is the preferred filtering medium, its selection is based on its proven high retentive efficiency in handling particles as small as .10 micron, operation at high filtration rates with minimum pressure loss and exceedingly slow plugging rate.

Wool is chemically neutral and felt is non-reactive with respect to common effluents, the exception being the highly corrosive liquids. This advantage is maintained through a temperature range up to approximately 212° F.

Felt is a permanent type of filtering material and can be cleaned by back washing, flushing with solvents, blowing with air pressure up to 135 lbs. psi, by vacuum and by mechanical agitation or brushing. Felts are satisfactorily reconditioned by such standard procedure as dry cleaning, as with naphtha, carbon tetrachloride or acetone, when due care is exercised to guard against shrinkage and warping. In some instances it has been found that the flow rate of a felt filter decreased after cleaning, but became constant at the lower rate after cleaning several times. The quality of the filtrate seems to be independent of this decreased rate of flow, and the apparent tendency is for the material to become more retentive after cleaning.

Chemical Arrests Plant Growth Safely

▶ A NEW plant growth regulator which, at low concentrations, stops the growth of tomato plants and the flowering of marigolds without killing the plants or causing visible damage has been discovered by Drs. W. B. Ligett, Calvin N. Wolf, R. E. Hay and D. P. Uhl of Ethyl Corporation Research Laboratories at Detroit and the Battelle Memorial Institute, Columbus, Ohio.

The chemical, Ethyl-214, is alpha-cyano-beta-(2, 4-dichlorophenyl) acrylic acid. Tests with it were reported to the journal, *Science*.

Flash-Sterilized Milk Keeps Flavor

➤ CANNING of flash-sterilized milk in sterile containers to replace long heating in a sealed can is perhaps the most exciting event that has taken place in the dairy industry, according to Dr. Charles Glen King, scientific director of the Nutrition Foundation, New York. Natural flavor is kept by this method, he told the symposium on food of the Centennial of Engineering. During the past 20 years much has been learned about what is in foods, how they are formed, and how the nutrients function in protecting human health.

As examples of major improvements in our food supplies, Dr. King said that:

Frozen canned orange juice, lemonade and lime juice have an assured vitamin content roughly equal to that of fresh juice.

Strong competitors to evaporated milk are being developed in the form of canned whole milk, frozen milk, powdered milk and milks with low fat content.

Enriched and prepared cereal products represent a big step forward in public service.

Development of new foods for the future may be aided by a new kind of professional, the biochemical engineer, Dr. King said. His raw materials of today — food — literally make the men of tomorrow.

It is no simple task, he said, as we look ahead a few years, to provide the physical means of building the world's three billion human bodies and minds to their respective individual peak levels of vigor and attainment, on a life-span basis.

Although "sales may grow on hot air for a time, children cannot," he stated. There are now about 50 nutrients essential to human life, and the list is growing.

The degree of success of the food industry in meeting its responsibility in health, economy and public confidence, Dr. King concluded, will be an important measure of man's capacity for progress in the century ahead.

New Method For Testing Milk Fat

➤ A SIMPLE new method, using a detergent, for measuring the fat content of milk and cream was reported to the Milk Industry Foundation by a U. S. Department of Agriculture chemist.

The same equipment as for the usual Babcock test can be used, with the detergent substituting for the sulfuric acid of the Babcock test. The new method measures the fat content directly, rapidly and just as accurately as before.

Only two reagents are required. One is a water solution containing very small amounts of a nonionic detergent and a phosphate salt. The other is 50% methyl alcohol. The new test was perfected by O. S. Sager, chemist at the Bureau of Dairy Industry, Washington.

Cyanides and Cyanamides Help Farms and Industries

Chemical Possibilities

Reprinted from "For Instance," American Cyanamid Co., New York City.

▶ IT MAY SEEM strange to "pickle" steel, but pickling is necessary to remove rust and mill scale which form on its surface in the mill. Dilute sulfuric acid is widely used for the pickling bath, but it also attacks the steel. This causes loss of useful steel, and excessive wear of the expensive dies in the finishing mill. Addition agents may be placed in the pickling bath to inhibit the attack on the steel, but usually they lengthen the time required to remove rust and scale. Research on selective chemicals has produced a new agent which inhibits attack on the steel without increasing the pickling time. It also prolongs the useful life of the pickling bath. The principal active ingredient in the new agent is sodium ferrocyanide.

The present has been called the "iron age," and there are constant reminders that iron is necessary to the proper functioning of our physical bodies, but even minute traces of iron are objectionable in many industrial processes. Some fermentation processes are quite susceptible to soluble iron compounds in the aqueous fermentation media. Frequently, the iron compounds may be removed by addition of sodium ferrocyanide which converts the soluble iron compounds into insoluble ones.

Organic acids are generally weak acids, but they pick up traces of iron from processing equipment. In some cases this spoils the pale color, or the fine flavor, so the iron must be removed; again, sodium ferrocyanide is called into action. This versatile chemical has also been credited with the removal of traces of copper from petroleum oils after they have been desulfurized.

In the mining industry many low grade ores can be utilized profitably because of beneficiation by the flotation process. Selective chemicals have been developed which "float off" the desirable minerals from the unwanted rock. Further selection of flotation chemicals permits a separation of the minerals when more than one may be present. Truly amazing results are obtained from the addition of very small percentages of specific chemicals. In this connection sodium ferrocyanide has been used successfully to depress certain minerals in the presence of others, thereby producing higher concentrates of the individual minerals.

Sodium ferrocyanide is a member of the illustrious family of cyanides and cyanamides which has made notable contributions to industry, agriculture, and medicine. Another member of this family is the complex ferrocyanide known as Prussian Blue, used for coloring paints and plastics. The calcium or sodium cyanides are responsible for the economical recovery of large quantities of gold by the cyanidation process. Hydrogen cyanide is a friend of the farmer and mill owner since it kills rats and ver-

min effectively and economically. Each of these cyanides does many minor chores in addition to the important work cited, and there are also many other cyanides.

One of the important sources for cyanides is cyanamide. Chemists put an *e* in cyanamide, but pronounce it as if the *e* were not there; i.e., cyanamid. The cyanamides also have a distinguished lineage, and the great sire is calcium cyanamide. It is a benefactor of humanity in its own right, and its profuse progeny is found in almost every field of human endeavor. Calcium cyanamide has been called "agriculture's most useful form of nitrogen" because it kills weeds, then after chemical breakdown, supplies nitrogen as a crop nutrient. Its high nitrogen content is also valuable to industry because the nitrogen is in combination with carbon. This assures its usefulness in the vast field of organic chemistry where it has already appeared as dyes, drugs, plastics, and fibers.

When lime (CaO) is fused with coke (C) in electric furnaces calcium carbide (CaC_2) is produced. If this is heated to about 2,000° F. with nitrogen, one carbon atom is removed, and two nitrogen atoms introduced into the molecule to form calcium cyanamide (CaNCN). For agricultural uses the nitrogen becomes available as plant food, and the calcium is transformed into lime for soil "sweetening." For organic synthesis the calcium is replaced with hydrogen to produce "free cyanamide" (H_2NCN). The latent possibilities in this small molecule fascinated the organic chemists, and from it they have created products which delight the eye, conserve human energy through added convenience, and even save life itself when it is stricken by disease. It is no wonder that chemists are not averse to burning midnight oil when such chemical possibilities await them at every turn!

Chemical Betters Diesel Fuel

➤ A FUEL additive has been developed to improve ignition qualities of diesel fuel. B. Bynum Turner, vice-president in charge of research and engineering of the Ethyl Corporation, reports that as little as 0.1% by volume of the ignition improver is enough to raise the cetane number of many distillate heating oils within the range of commercial diesel fuels.

Cetane fuels, used in diesel engines, ignite more quickly than do octane fuels which are used in gasoline engines. The cetane number is an indication of the speed at which the fuel will ignite.

The fuel additive, called DB-36 amyl nitrate, should enable refiners to supply the required grades of diesel fuels in the needed quantities and at low cost, and also increase flexibility of refining operations.

Allethrin is a synthetic insecticide which has some of the properties of natural pyrethrum.

Chlordane, aldrin and toxaphene are favorite insecticides used to control grasshopper pests.

Chemical Techniques Form Basis for Patents

Inventions in Chemical Fields

Copies of patents may be obtained from the Commissioner of Patents, Washington 25, D. C. for twenty-five cents each. Send money, money order or patent office coupon, but not stamps, and order by patent number.

Smoke-Smelling Fire Alarm

➤ A NEW smoke-smelling fire alarm which continuously sniffs air around it is the latest wrinkle in fire protection. Its inventor, Sante Giudice of Owosso, Mich., says it is particularly suitable for protecting warehouses, stockrooms and other places visited only occasionally by a watchman.

A small motor sucks air into the device and blows it through two outlets. One of the outlets is covered with a bit of cloth that filters out smoke. When a fire breaks out, the filter becomes partly clogged with smoke particles, cutting down on the amount of air rushing from the outlet. A valve at the bottom of the filter assembly then settles into place, making electrical contact with the alarm system to warn of fire.

The second outlet, through which unfiltered air is blown, acts as an automatic switch in case something goes wrong with the blower motor, or in case the power fails. When air stops rushing through that outlet, a valve opens the fire-alarm circuit a fraction of a second before the filter valve sets off the warning. The device received patent number 2,613,259.

Aluminum Brightener

➤ ALUMINUM ware can be brightened with a chemical solution invented by William C. Cochran of Brussels, Belgium. The patent, number 2,613,141, was assigned to the Aluminum Company of America, Pittsburgh, Pa.

Mr. Cochran says that aluminum pots and pans become shiny when dipped into a hot solution of phosphoric acid, hydrogen peroxide and water. The process works especially well for aluminum articles having mirror-like surfaces.

By weight, phosphoric acid makes up 75% of the solution, hydrogen peroxide 3.5% and water 21.5%. The solution should be heated to about 194 degrees Fahrenheit, a little lower than the temperature of boiling water. It should be stirred while being used.

Uranium Purification

➤ A METHOD of purifying uranium has been patented and declassified by the Atomic Energy Commission. The invention deals specifically with certain types of uranium complexes described as having fluoro substituted beta-keto esters.

These complexes may be prepared, the patent says, by reacting aqueous solutions of uranium compounds capable of supplying ionic uranium with a fluoro substituted beta keto ester. The mixture is then made alkaline and the complexes precipitated or extracted with a solvent.

The inventors are Hermann I. Schlesinger, Chicago, and Herbert C. Brown, Detroit. They assigned their patent, number 2,614,113 to the Atomic Energy Commission.

Airplane Radar Domes

➤ DOMES protecting the radar carried on airplanes must at one and the same time protect the radar apparatus against physical damage and be "transparent" to radio waves. Lester S. Cooper, Columbia, Conn., has invented an airplane radar dome which, he claims, does away with the deficiencies of previous models. He received patent number 2,614,059. and assigned it to Rubatex Products, Inc., New York.

In previous models, according to the patent, the use of glue interfered with the transmission of signals. The dome was made of a layer of rubber between two layers of fiber glass. Pieces of rubber had to be glued together, thus making a pattern of veins of glue which was opaque to radio waves.

Mr. Cooper molds his rubber in one piece and vulcanizes it after it has been put between the two sheets of glass fiber.

Noises Improve Battery

➤ SUPERSONIC "noises" can markedly improve the battery performance of a particular kind of dry cell which has been manufactured in huge quantities for both military and civilian use, according to a patent assigned to the Army. The supersonic vibrations are applied to the manganese dioxide in the depolarizing mixture surrounding the carbon electrodes of Le Clanche type cells. Vibrations can also be applied to the other ingredients of the mixture. This reduces the particle size in the mixture to the smallest possible order. The inventor is George Hunrath, Asbury Park, N. J., and his patent is numbered 2,613,877.

Synchrotron Atom Smasher

➤ A PATENT has been granted for the synchro-cyclotron, one of the most powerful of atom-smashers. The inventor is Dr. Edwin M. McMillan, professor of physics at the University of California.

The synchro-cyclotron, also called the synchrotron, gets around Einstein's theory of relativity which works to slow down the particles hurled at atoms once they have achieved high energies.

The patent was granted despite acknowledgment by Dr. McMillan of an independent development of the synchro-cyclotron by a Russian scientist, V. Veksler. News of the Russian development appeared in a letter by Dr. Veksler in the American Physical Review, early in 1946.

The patent was apparently granted because no specific description of the Russian synchro-cyclotron had appeared in any publication available to the Patent Office prior to Dr. McMillan's application.

The University of California, back in 1946, set to work building a 300 million electron volt synchro cyclotron with the cooperation of the Manhattan District, forerunner of the Atomic Energy Commission. Dr. Veksler had announced that Russia was building one with only 30 million electron volts of power.

As the energy of particles in an ordinary cyclotron increases, their

mass also increases, in accordance with the theory of relativity, and they tend to slow down. This gets them out of phase with the regularly-spaced, high-frequency electrical pushes they get and thus they slow down even more.

Dr. McMillan discovered that, by increasing the magnetic field of the machine's electromagnet as the particles reach higher energies, he can jerk lagging projectiles up to the acceleration point exactly in time to receive a new push.

With the synchro-cyclotron, speeds of particles approaching the speed of light have already been achieved. Dr. McMillan received patent number 2,615,129, which he assigned to the Atomic Energy Commission.

Chemical Warfare Agent

➤ A SIMPLE method of making a chemical warfare agent first discovered by the Germans during World War I has been patented by Dr. Sidney Weinhouse, Chester, Pa., and Morris S. Kharasch, Chicago. Dr. Weinhouse now is working at Philadelphia's Lankenau Hospital on the metabolism of cancer cells.

The patent was withheld by the Defense Department until now. It was first applied for early in 1944 and is assigned to the Army Department. Its number is 2,615, 043.

The agent is ethyl dichlorophosphine. The method consists of reacting phosphorus trichloride with tetraethyl lead at a temperature above 90 degrees, Centrigrade. The inventors say this method can be applied on a commercial scale, with some modifications.

Atomic Air Burst Finder

➤ A DIRECTION finder which looks like a table lamp with lamp shade can tell civil defense workers exactly where an atomic bomb has exploded —how far above the ground and over what position on the ground.

The finder was invented by Gerard A. Allard, Schenectady, N. Y., and assigned to the U. S. Atomic Energy Commission. It received patent number 2,615, 249.

The "lampshade," in conical form, is mounted on a pipe set in the ground, preferably in an open area. Extending up from the pipe to the top of the conical lampshade, is a rod. When an atomic bomb goes off, it releases radiant heat with the speed of light. The heat from the Hiroshima bomb was able to scorch paint for a distance of 7,000 yards from ground zero.

However, the time of the heat flash was so short that if anything, even a leaf, was in the way it left a distinct shadow in the scorched paint. The "lampshade" takes advantage of this fact. The inside of the shade is marked off into directions in degrees, such as are found on a compass. Horizontal lines are also indicated.

When an A-bomb goes off, the shadow of the rod in the center of the shade is thrown onto the inside of the shade. The position of the shadow indicates a reading, both as to direction and height. Readings from two such direction finders can enable civil defense workers to pinpoint the A-bomb blast.

A heat pump operates much like an over-size refrigerator.

Book Condensations

FROM ATOMOS TO ATOM: The History of the Concept *Atom*—Andrew G. Van Melsen, translated by Henry J. Koren—*Duquesne University Press,* 240 p., $4.25. Tracing the history of the atomic theory from its earliest beginnings in ancient Greek philosophy.

THE EVOLUTION OF CHEMISTRY: A History of Its Ideas, Methods and Materials — Eduard Farber — *Ronald Press,* 349 p., illus., $6.00. Selections from early books and papers are used so far as possible to describe the important investigations of the past.

THE COMMON AND SYSTEMATIC NOMENCLATURE OF THE SIMPLER ORGANIC COMPOUNDS—Fred Semeniuk—*School of Pharmacy, University of North Carolina,* 55 p., paper, $1.25. Reference material for the review of advanced students and to provide beginners with material for organized study of the names of compounds, etc.

THEORY OF NUMBERS—B. H. Stewart—*Macmillan,* 261 p., illus., $5.50. A textbook planned for a mixed group of beginning and graduate students. Footnotes indicate to the student whether any partcular chapter is basic or may safely be skipped.

TEXTBOOK ON QUANTITATIVE INORGANIC ANALYSIS—I. M. Kolthoff and E. B. Sandell—*Macmillan,* 3d ed., 759 p., illus., $6.50. The aims and plan of the first edition have been adhered to in spite of recent development of instrumental methods. It is the belief of the authors that the classical methods are still essential knowledge.

FERROMAGNETISM AND THE CURIE POINT — B. M. Aldrich — *Oklahoma Engineering Experiment Station,* 44 p., illus., paper, free upon request to publisher, Oklahoma A & M College, Stillwater, Okla. This bulletin was prepared in response to a need to review present theories of magnetism in the light of recent research results with the aim of developing a new theory.

GALILEO: First Observer of Marvelous Things—Elma Ehrlich Levinger —*Messner,* 180 p., $2.75. A biography of the great scientist written with imagination.

CONTRIBUTIONS OF BROWNING RESEARCH TO RATION ITEM STABILITY—Jack H. Mitchell, Jr. and Martin S. Peterson, Eds. — *Research and Development Associates,* 56 p., paper, $1.00. Papers reporting research on deterioration of dehydrated foods.

SCIENCE NEWS 25—A. W. Haslett, Ed.—*Penguin,* 128 p., illus., paper, 50 cents. Another of these interesting British collections of articles on various scientific subjects.

THE CHEMISTRY AND PHYSIOLOGY OF THE NUCLEUS: Experimental Cell Research, Suplement 2, 1952—V. T. Bowen and M. J. Moses, Eds.—*Academic Press,* 402 p., illus., $7.00. Papers presented at the Brookhaven symposium on nuclear chemistry and biology together with the recorded discussions.

CAREERS IN CHEMISTRY AND CHEMICAL ENGINEERING—Walter J. Murphy and others—*Fisher Scientific Company,* 94 p., illus., paper, free upon request to publisher, 717 Forbes Street, Pittsburgh 19, Pa. This is the

same excellent booklet previously available through the American Chemical Society.

ANTOINE LAVOISIER, SCIENTIST, ECONOMIST, SOCIAL REFORMER — Douglas McKie — *Schuman,* 440 p., illus., $6.00. A reader in the history of science at the University of London writes this biography of the French chemist famous for finding the composition of air and for his work on explosives.

MODERN SCIENCE AND MODERN MAN —James B. Conant—*Columbia University Press,* 111 p., $2.25. Lectures dealing with the impact of modern science on the ambitions, the hopes, the fears and the outlook of the enlightened citizen of today.

ANNUAL REPORT 1951 NATIONAL BUREAU OF STANDARDS—A. V. Astin, Director—*Govt. Printing Office,* U. S. Dept. of Commerce Misc. Publication 204, 105 p., illus., paper, 50 cents. Research of the past year has been devoted largely to problems of national defense, including work on the electronic computer, electronic miniaturization and printed circuits, and development of an all-glass filter paper.

COLLOID SCIENCE: Volume I, Irreversible Systems—H. R. Kruyt, Ed.—*Elsevier Publishing Company,* 389 p., illus., $11.00. To serve as a guide to colloid science, stressing the harmony that exists between classical colloid science and the field of macromolecular systems. This volume completes the work, the second volume of which appeared in 1949.

MAN THE CHEMICAL MACHINE — Ernest Borek — *Columbia University Press,* 219 p., $3.00. Tracing, for the layman, the development of knowledge about the chemistry of the body since urea was synthesized in 1828.

THE CHEMISTRY OF SYNTHETIC DYES, Volume II—K. Venkataraman —*Academic Press,* 737 p., $15.00. A technical work by the director of the department of chemical technology of the University of Bombay.

INDUSTRIAL SCIENCE, PRESENT AND FUTURE: A Collection of Papers Presented at the Installation of the Section on Industrial Science of the AAAS at the Philadelphia Meeting on December 28-30, 1951 — Ruth C. Christman, Ed.—*AAAS,* 152 p., paper $2.00. One of the purposes of the new section is to further the application of science in industry.

ORGANIC CHEMISTRY—E. E. Turner and Margaret M. Harris—*Longmans, Green,* 904 p., $10.00. By authors at the University of London who describe the subject as a tourist guide would, giving the reader glimpses of chemical scenery of every sort which will encourage him to revisit the locality.

HARWELL: The British Atomic Energy Research Establismment 1946-1951—*Philosophical Library,* 128 p., illus., $3.75. Describing research conducted and measures taken to protect health and safety. A bound edition of a book originally published in paper in July, 1952, by *Her Majesty's Stationery Office.*

ORGANIC CHEMISTRY: The Chemistry of the Compounds of Carbon—Lucius Junius Desha—*McGraw-Hill,* 2d ed., 595 p., illus., $6.50. A complete revision makes this, in effect, a new textbook. Intended for college students who do not intend to continue with the study of chemistry.

Proudly Presented

➤ MILL and forest residues should have greater use as sources of chemicals in the opinion of the Timber Engineering Co., affiliate of the National Lumber Manufacturers Association. This is expressed in a new booklet, "Advancements in Wood Research and Timber Engineering," which may be obtained without charge from Timber Engineering Co., 1319 18th St. N.W., Washington 6, D. C.

➤ NEW ADHESIVES made of vinyl compounds will stick to wood, glass, metal, paper, leather, cork and other substances, according to the manufacturers. They are offered under the name of CD Cements by the Chemical Development Corp., Danvers, Mass., where a technical staff is ready to help users with specific problems.

➤ "NINETY PERCENT of the medical prescriptions filled today could not have been written fifteen years ago." With these words Parke-Davis pharmaceutical firm introduces its new booklet, "Your Future and Ours," describing opportunities for technical employment in their organization. The booklet is addressed to college graduates with technical educations, and will be distributed to colleges and universities throughout the U.S. and Canada.

➤ BIOS LABORATORIES, 17 W. 60th St., N. Y. C., can supply the following organic chemicals — Cerebronic Acid, Diethyl Zinc, dl-Hydroxycitric Acid, dl-Kynurenune Sulfate, Protoporphyrin IX.

➤ ALPHA-CHLOROACETAMIDE, manufactured by Chemical Development Corporation of Danvers, Massachusetts, is reported to act as an effective acid type catalyst for Urea Formaldehyde, Melamine Formaldehyde, and similar materials. The generation of heat produces a low pH which further acts to catalyze the reaction. Additional uses include applications in the photographic industry and in the synthesis of organic intermediates for the pharmaceutical, dye, and surface active fields. Special bulletin on request.

➤ A NEW PROCESS which eliminates dehydration of cellophane during printing is offered by the Dobeckmun Co., Box 6417, Cleveland, Ohio. The process is called "normalizing" and is said to be especially valuable in extremely dry climates or in colder climates where film is stored in heated buildings and for use with products which are sensitive to odors from printing inks.

➤ HYDROGEN PEROXIDE can often be used to free industrial processing solutions of some particular metal, such as iron. Bulletin No. 26, which may be obtained by writing to the Becco Sales Corp., Station B, Buffalo 7, N. Y., gives directions for isolating metal salts from process solutions for electrolytic nickel plating, beryllium production, magnesium production, phosphatizing, optical glass production containing lanthanum salts, and tin recovery from non-ferrous scrap.

➤ NYLON and acetate fibers present certain difficulties when bleached with conventional materials and methods. Peracetic acid is offered by the Becco Sales Corp., Buffalo 7, N. Y., to overcome these difficulties. The process is described in their Bulletin No. 44.